

# the **burden of** **asthma**

in **Indiana**



prepared by the **Indiana Joint Asthma Coalition**  
(InJAC)

**Data Collection and  
Surveillance Workgroup**

The Indiana State Department of Health and Indiana Department of Environmental Management thank the members of the Data and Surveillance Workgroup of the Indiana Joint Asthma Coalition (InJAC) for their dedication in directing this effort and other contributors for their commitment. Without their volunteered time and energy, none of this would be possible.

The Indiana Joint Asthma Coalition thanks Elizabeth Hamilton-Byrd, medical epidemiologist, Epidemiology Resource Center, Indiana State Department of Health, for providing mortality data and Linda Stemnock, Epidemiology Resource Center for assistance with BRFSS data interpretation.

The Indiana Joint Asthma Coalition thanks Cindy Woodruff, epidemiologist, Indiana Asthma Program for the many hours of detailed work she put into researching and assembling data for this report.

This publication was supported by Cooperative Agreement # U59/CCU52080-02 from the Centers for Disease Control and Prevention (CDC). Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention.

## **InJAC Data and Surveillance Workgroup**

### **Chair:**

Stephen M. Downs, MD, MS  
Director, Indiana Children's Health Services Research  
Department of Pediatrics  
Indiana University School of Medicine

### **Workgroup Members**

Joel Conner  
Data Section  
Maternal and Child Health  
Indiana State Department of Health

Mat Delillo  
Office of Medicaid Policy and Planning  
Indiana Family and Social Services Administration

Elizabeth Hamilton-Byrd, MD  
Medical Epidemiologist  
Epidemiology Resource Center  
Indiana State Department of Health



Robert G. Lehnert, PhD  
Professor, Public and Environmental Affairs  
Indiana University-Purdue University Indianapolis

Jon E. Lewis, PhD  
Director, Data Analysis  
Epidemiology Resource Center  
Indiana State Department of Health

Sarah Raymond  
Environmental Scientist  
Indiana Department of Environmental Management

Marc Rosenman, MD  
Assistant Professor  
Department of Pediatrics  
Indiana University School of Medicine

Linda Stemnock, BS  
BRFSS Coordinator  
Epidemiology Resource Center  
Indiana State Department of Health

Bernice Ulrich, RHIA  
Vice President,  
Indiana Hospital & Health Association

Lisa Winterheimer  
Indiana Primary Health Care Association

Cynthia Schamel Woodruff  
Epidemiologist, Asthma Control Program  
Indiana State Department of Health

**Additional Contributors:**

Frederick Leickly, MD  
Clinical Associate Professor of Pediatrics  
Department of Pediatrics  
Indiana University School of Medicine

Judith Ganser, MD, MPH  
Director, Maternal and Child Health  
Indiana State Department of Health



# Table of Contents

|  |    |
|--|----|
| Executive Summary .....  | 8  |
| The Burden of Asthma.....  | 13 |
| Asthma .....   | 14 |
| Asthma Triggers .....  | 15 |
| Control of Asthma .....  | 15 |
| Surveillance .....   | 16 |
| Asthma in Indiana .....  | 20 |
| Prevalence.....  | 20 |
| Measures of Severity .....   | 40 |
| Morbidity .....  | 40 |
| Mortality.....   | 49 |
| Cost of Asthma.....  | 50 |
| Financial Costs .....  | 50 |
| Quality of Life.....   | 51 |
| Quality of Asthma Care.....  | 57 |
| Environment .....  | 67 |
| Appendix.....  | 72 |
| <br>   |    |
| Figure 1   Lifetime asthma prevalence by sex: .....  | 22 |
| Figure 2   Lifetime asthma prevalence by age: .....  | 22 |
| Figure 3   Lifetime asthma prevalence by race/ethnicity:.....                                  | 23 |
| Figure 4   Lifetime asthma prevalence by household income: .....                               | 23 |
| Figure 5   Lifetime asthma prevalence by educational attainment:..                             | 24 |
| Figure 6   Current asthma prevalence by sex:.....  | 25 |
| Figure 7   Sex, percent distribution in respondents with current<br>asthma: Indiana 2002 ..... | 25 |
| Figure 8   Current asthma prevalence by age: .....   | 26 |
| Figure 9   Current asthma prevalence by race/ethnicity: .....                                  | 26 |
| Figure 10   Adults with current asthma by race/ethnicity: .....                                | 27 |
| Figure 11   Current asthma prevalence by household income: .....                               | 27 |



|           |   |    |
|-----------|---|----|
| Figure 12 | Current asthma prevalence by educational attainment: ...  | 28 |
| Figure 13 | Current asthma prevalence by employment status: .....   | 28 |
| Figure 14 | Employment status, percent distribution in respondents<br>with current asthma: .....  | 29 |
| Figure 15 | Current asthma prevalence by marital status: .....  | 29 |
| Figure 16 | Current asthma prevalence by BMI category:.....   | 30 |
| Figure 17 | BMI category, percent distribution in respondents with<br>current asthma: .....   | 30 |
| Figure 18 | Indiana Hospitalizations for Asthma 1997 - 2002.....  | 42 |
| Figure 19 | Number of Asthma Hospitalizations - All Races .....   | 43 |
| Figure 20 | Number of Asthma Hospitalizations - White.....  | 44 |
| Figure 21 | Number of Asthma Hospitalizations - Black.....  | 45 |
| Figure 22 | Asthma Hospitalization Rate - All Races .....   | 46 |
| Figure 23 | Asthma Hospitalization Rate - White.....  | 47 |
| Figure 24 | Asthma Hospitalization Rate - Black.....  | 48 |
| Figure 25 | Indiana Asthma Mortality 1997 – 2002 Number<br>of Deaths .....  | 49 |
| Figure 26 | Indiana Asthma Mortality 1997 – 2002 Rate per<br>100,000 .....  | 50 |
| Figure 27 | Direct Medical Costs of Asthma in a Medicaid Cohort of<br>Children ages 0-17 .....  | 51 |
| Figure 28 | Direct Medical Costs of Asthma in a Medicaid Cohort of<br>Adults ages 19-64 .....   | 52 |
| Figure 29 | Reported health status, distribution in respondents<br>with/without current asthma: Indiana 2002 .....                                    | 53 |
| Figure 30 | Number of days felt healthy in the last month, distribution<br>in respondents with/without current asthma: .....                          | 54 |
| Figure 31 | Number of days felt sad, blue or depressed in last month,<br>percent distribution in respondents with/without current<br>asthma: .....    | 55 |
| Figure 32 | Number of days felt stressed during the last month,<br>percent distribution in respondents with/without current<br>asthma: .....          | 56 |
| Figure 33 | Number of days didn't get enough rest during the last<br>month, percent distribution in respondents with/without<br>current asthma: ..... | 57 |
| Figure 34 | Current asthma prevalence by medical care in last<br>year: .....  | 58 |
| Figure 35 | Medical care in last year, percent distribution in<br>respondents with/without current asthma: .....                                      | 59 |
| Figure 36 | Current asthma prevalence by healthcare coverage: .....   | 59 |

|           |   |    |
|-----------|---|----|
| Figure 37 | Healthcare coverage, percent distribution in respondents with/without current asthma: .....                             | 60 |
| Figure 38 | Current asthma prevalence by place of usual care:.....  | 60 |
| Figure 39 | Place of usual care, percent distribution in respondents with/without current asthma: .....                             | 61 |
| Figure 40 | Current asthma prevalence by ability to obtain medical care in last 6 months: .....                                     | 61 |
| Figure 41 | Ability to obtain medical care in last 6 months, percent distribution in respondents with/without current asthma: ..... | 62 |
| Figure 42 | Receipt of flu shot in last 12 months, percent distribution in respondents with/without current asthma: .....           | 63 |
| Figure 43 | Rx Claims for Inhaled Steroids for Children under 18 .....  | 64 |
| Figure 44 | Office Visits for Asthma in Children under 18 .....   | 65 |
| Figure 45 | Rx Claims for Inhaled Steroids in Adults 18 - 64 .....  | 66 |
| Figure 46 | Office Visits for Asthma in Adults 18 - 64 .....  | 67 |
| Figure 47 | Smoking status, percent distribution in respondents with/without current asthma: Indiana 2002 .....                     | 68 |
| Figure 48 | Age began smoking regularly, percent distribution in respondents with/without current asthma: .....                     | 69 |
| Figure 49 | Prevalence of current asthma by age first began smoking: .....  | 70 |
| Figure 50 | Percent distribution of smoking rules at home among respondents with current asthma: .....                              | 70 |
| Figure 51 | Percent distribution of smoking rules in common areas at work among respondents with current asthma: .....              | 71 |
| Figure 52 | Percent distribution of smoking rules in work areas at work among respondents with current asthma: .....                | 71 |
| Figure 1a | Age, percent distribution in respondents with/without current asthma: .....   | 72 |
| Figure 2a | Educational attainment, percent distribution in respondents with/without current asthma: .....                          | 73 |

|                |   |           |
|----------------|---|-----------|
| <b>Table 1</b> | <b>Sex distribution of those with asthma in Medicaid for at least 11 of 12 months in FY 2003.....</b>             | <b>32</b> |
| <b>Table 2</b> | <b>Asthma prevalence by sex: those in Medicaid for at least 11 of 12 months in FY 2003* .....</b>                 | <b>32</b> |
| <b>Table 3</b> | <b>Race/ethnicity distribution of those with asthma in Medicaid for at least 11 of 12 months in FY 2003 .....</b> | <b>32</b> |
| <b>Table 4</b> | <b>Asthma prevalence by race/ethnicity: those in Medicaid for at least 11 of 12 months in FY 2003* .....</b>      | <b>33</b> |
| <b>Table 5</b> | <b>Number and prevalence of asthma in Medicaid cohort, All ages, by county: .....</b>                             | <b>33</b> |
| <b>Table 6</b> | <b>Number and prevalence of asthma in a Medicaid cohort of children age 0 – 17 years, by County: .....</b>        | <b>35</b> |
| <b>Table 7</b> | <b>Number and prevalence of asthma in a Medicaid cohort of adults age 18 – 64 years, by County: .....</b>         | <b>38</b> |

# Executive Summary

Asthma is a pulmonary disease that results from oversensitivity of the airways in the lungs, causing the airways to narrow and clog in response to irritants like allergens, cold, dust, exercise, emotional stress and other stimulation. This report on asthma summarizes data available describing the burden of asthma on the people of Indiana. Because of the intrinsic limitations in the available data, our view of asthma is somewhat imprecise. This is because data collection is often imperfect, some data apply only to certain populations, and different sources of data require different case definitions for asthma. Nonetheless, these data paint a picture of asthma that can guide new initiatives in asthma control and track improvements as these initiatives move forward.

We have organized the asthma burden report to answer five questions:

1. Who suffers from asthma in Indiana?
2. How severe is the asthma in our state?
3. What are the costs of asthma in Indiana, including both financial and human costs?
4. How well do we care for those in Indiana with asthma?
5. How do environmental pollutants contribute to asthma?

To answer these questions, we turned to four primary sources of data:

1. The Behavioral Risk Factor Surveillance Survey (BRFSS), a telephone survey developed by the Centers for Disease Control and Prevention, monitors state-level prevalence of the major behavioral risks among adults associated with premature morbidity and mortality), and includes a module assessing asthma in non-institutionalized civilian adults.
2. Medicaid administrative claims data from the Indiana Office of Medicaid Policy and Planning. These represent claims for health care expenditures on children under age 18 years from families with incomes below twice the poverty level. Claims are also included for adults and children who qualify for Medicaid because they are blind, disabled or qualify under other provisions. These claims include hospitalizations, emergency room and doctor visits, and medications.
3. Hospital discharge data from the Indiana Hospital & Health Association. These include information on hospitalizations throughout Indiana with a discharge diagnosis of asthma.
4. Mortality statistics from death certificates, reported to the Indiana State Department of Health.





## **Who has asthma?**

The prevalence of asthma is similar to that for the United States as a whole. According to the 2002 Indiana BRFSS survey, 7.5% of adults aged 18 and older currently had asthma. This figure is identical to the overall US statistic. Between 11% and 12% of adults in Indiana reported they had ever had asthma. This is also similar to the US as a whole.

Asthma disproportionately affects certain subgroups in the population. Although the population of adult men and women in Indiana was about 50-50 in 2002, more than two-thirds of the adults with current asthma were women. Current asthma prevalence among adult women was 9.8%, nearly twice the 5.1% prevalence among adult men. Hospitalization data showed the largest number of asthma hospitalizations among adults were in women, ages 40-49, with numbers nearly as large in women 50-59 and 30-39. This pattern was seen across all race/ethnic categories.

In the Indiana Medicaid population, 14.2% of adults suffer from asthma compared to 10.4% of children. Among children, a slightly higher percentage of boys have asthma than girls. Among adults, women are almost twice as likely to report having asthma as men.

Individuals from households with annual household incomes below \$15,000 reported having asthma at nearly twice the rate as those with incomes of \$25,000 – \$49,999, and reported having asthma at more than twice the rate as those with incomes of \$50,000 or more. A higher percentage of unmarried and unemployed individuals and those with less than a high school education reported having asthma compared to the rates reported by those who were married, employed or had graduated from high school.

According to 2002 BRFSS data, the self-reported prevalence of current asthma in Indiana was lowest among Hispanics (5.6%). Among non-Hispanics, the prevalence of current asthma was higher among the multi-racial (13.5%), black (12.2%) and other (10.9%) racial categories when compared to whites (7.1%). In the Medicaid cohort, the prevalence was lowest among Hispanics (7.2%), and highest among whites (12.6%). Prevalence among blacks in the Medicaid cohort was 10.0%, and 8.6% in the other racial category.

The BRFSS data also show a possible association between obesity and asthma. The prevalence of asthma among obese respondents (BMI >30) was 10.1%. The prevalence of asthma among normal weight respondents (BMI 18.5-25) was 6.5%, and 6.3% among overweight respondents (BMI 25-29.9). Whether asthma leads to obesity or obesity leads to asthma is a point of controversy.

More detailed analyses available from claims data among Medicaid enrollees, shows a wide variation in the prevalence of asthma among the counties of Indiana, from a low of 7.3% in Elkhart County to a high of 17.3% in Davies County. Despite speculation about

health risk behaviors or possible differences in environmental exposures, the reasons for the variation are not known.

### **How bad is the asthma?**

There is both good news and bad news about what has happened to the severity of asthma in recent years. Longitudinal data gathered by the Indiana State Department of Health show that hospitalization rates have declined almost 20% since 1997.

Consistent with the demographic trends in asthma, Hospitalization rates for asthma are higher in blacks than whites and highest among boys under 5 years and women in their 40s. Asthma deaths have also declined 27% since 1997.

Nonetheless, other measures indicate that the severity of asthma is significant. Consistent with this, 17.3% of respondents to the BRFSS who have asthma report having symptoms every day; 54.9% said they had had an asthma attack in the last year, and 30% required urgent care for asthma. Among children with asthma who were enrolled in Medicaid at least 11 of 12 months in 2003, 4% were hospitalized with a principal diagnosis of asthma and 10% had an emergency room visit with a principal diagnosis of asthma.

### **What are the costs of asthma?**

Asthma is associated both with financial costs and human suffering, the real burden of asthma. Direct medical costs are only a fraction of the total financial cost attributable to asthma. They do not include costs to private insurance and uninsured individuals, the indirect costs from lost work, travel, daycare, and the myriad other costs that accompany chronic disease.

The cost in human suffering is also significant. In the 2002 BRFSS survey, adults with current asthma rated their own health status lower than adults without current asthma. They reported their health as very good or excellent at a rate 35% lower than those without current asthma and were almost three times as likely to report their health as poor. Those with current asthma also reported fewer days of feeling well in each month. Adults with current asthma reported feeling depressed every day, at a rate three times greater and they reported feeling stressed more frequently and feeling rested less frequently than those without current asthma.

### **How well do we care for asthma?**

Based on the consensus guidelines of the National Heart Lung and Blood Institute (NHLBI), persons with asthma should have routine visits to the physician twice a year. Indiana's BRFSS data show that only 52.5% of respondents with current asthma indicated they had at least one routine checkup for their asthma in the past 12 months, and over 27% had no medical care in the preceding year. In fact, 13% reported being unable to get medical care at all in the previous 6 months.

When asked what their usual source of care was, 74% of those with current asthma and 78% of those without current asthma reported the doctor's office. However, those with current asthma reported using public health clinics at a rate about 50% higher than those without current asthma. Respondents with current asthma also reported using an emergency room as their usual source of medical care at a rate nearly twice the rate of those without current asthma. The use of an emergency room as the usual place of care makes continuity of care for a chronic condition impossible, resulting in poor quality of asthma care.

Two markers of quality of asthma care are the rate of influenza (flu) vaccination and the use of controller medications. Flu vaccines are recommended for all people with asthma. In Indiana, over 65% of people with asthma had no flu shot, according to the 2002 BRFSS survey. The NHLBI guidelines recommend daily controller medications (e.g., inhaled steroids) for anyone with "persistent asthma." This would require several controller prescriptions per year. Among a Medicaid cohort of children who met the NCQA criteria for a diagnosis of persistent asthma, using Medicaid claims data, nearly half received no controller medication at all during FY 2003, and, of those who did receive a controller, most had only one or two prescriptions filled.

Based on available data, those in Indiana with asthma would benefit from improvements to both access to, and quality of care.

### **How do environmental pollutants contribute to asthma?**

Environmental triggers are thought to be important contributors to asthma. Environmental pollutants can be categorized as indoor or outdoor. Outdoor pollutants and the role they play in asthma is an area that requires additional work. While the Indiana Department of Environmental Management monitors outdoor pollutants, the impact of these pollutants on asthma needs further investigation.

The most significant indoor pollutant affecting asthma is environmental tobacco smoke. Some data on environmental tobacco smoke exposure among adults in Indiana was reported in the 2002 BRFSS survey. Over 30% of Indiana adults with current asthma were smokers. This rate of smoking was higher than that of people without asthma. Even among those who didn't smoke, there was some risk of smoke exposure at home or at work. BRFSS respondents with current asthma reported that in 26% of their homes and over 10% of their workplaces, there were either no rules governing smoking or rules that allowed smoking in all areas. Because environmental tobacco smoke is a well-established asthma trigger, this may be an important contributor to asthma burden.

## **Summary**

Adults in Indiana experience asthma at about the same rate as adults in the US overall. Asthma disproportionately affects women, children, certain minorities and the poor. Severity of asthma, based on hospitalizations and deaths appears to have improved in the last seven years, but a large proportion of asthma in Indiana still appears to be

severe. The consequences of asthma are financially costly and are associated with decreased quality of life indicated by higher rates of depression, stress and poor self-rated health status among those with the disease. Care of asthma appears to be compromised by barriers to access and deficiencies in quality. The effect of environmental pollutants on asthma needs further investigation, but tobacco smoke – both active and passive – probably contributes to the asthma burden.

# The Burden of Asthma

The burden of a disease is its impact on the person diagnosed with the disease, his/her family and caregivers and the greater community in which the person lives. Although many people often speak only of monetary cost when they discuss the burden of a disease, the burden also includes the impact on the quality of life for the individual with the disease and his/her caregivers.

Asthma is one of the most common chronic diseases in the world, yet asthma is often uncontrolled or poorly controlled, needlessly restricting school, work and leisure activities for countless numbers of asthma sufferers. By collecting and monitoring data on the burden of asthma in Indiana, strategies can be devised to address areas and populations where interventions can be targeted, implemented and evaluated with the goal of reducing the burden of asthma in Indiana, both in terms of the financial cost and quality of life for those with asthma.

From a financial perspective, asthma is a costly disease. Control of asthma requires long-term medical treatment, including at least one prescription medicine. Uncontrolled asthma may require visits to the emergency room and/or hospitalization. According to the Cost of Illness Handbook published by the Environmental Protection Agency (EPA), the lifetime cost (in 1999 dollars) for direct medical care for an average patient with asthma is \$50,000. The lifetime cost for a high use patient, defined as a patient with moderate to severe asthma whose disease has not been carefully managed, soars to \$220,000.

From a quality of life perspective, asthma is also a costly disease. Patients with asthma report more limitations in their daily activities than patients without asthma. Asthma is the most common cause of missed school days and a high percentage of missed workdays. People with asthma report fewer days when they feel healthy and energetic than people without asthma.

**The lifetime direct medical costs for an average person with asthma is \$50,000**

**The lifetime direct medical costs for a person with moderate to severe asthma that has not been carefully controlled is more than \$200,000**

*Source: EPA Cost of Illness Handbook  
Cost in 1999 dollars*

# Asthma

Asthma is a chronic disease that affects the lungs. When a person has asthma, the inside walls of the airways of the lungs are inflamed, making them more sensitive and more reactive than the airways of a person who does not have asthma. The airways react more strongly to inhaled irritants, allergens or respiratory tract infections than those of a person without asthma and this reaction can trigger an asthma attack or episode.

During an asthma attack, the airways narrow and less air can flow in and out of the lungs. Inflammation increases and the muscles around the airways tighten, which makes the airways more swollen and narrower. More mucus than normal is produced, which further clogs and narrows the airways. These changes cause the symptoms of an asthma attack, like wheezing, coughing, feeling out of air, feeling tightness of the chest or throat, and trouble breathing.

Asthma attacks are not all the same. They can vary from mild to severe. A severe asthma attack can be life threatening, since the airways can close to the point that not enough oxygen reaches the vital organs.

- ◆ **In 2001, an estimated 31.3 million Americans had been diagnosed with asthma during their lifetimes.**
- ◆ **20.3 million Americans currently had asthma.**
- ◆ **12 million Americans had an asthma attack during the previous year.**

*Source: CDC National Center for Environmental Health, 2001*

In most cases it is unknown what causes asthma to develop or why the people who develop asthma have inflamed airways. It is known that asthma is closely linked to allergy and that children with a family history of allergy or asthma are more likely to develop asthma. A person who has a parent with asthma is three to six times more likely to develop asthma than a person who does not have a parent with asthma. Some research suggests that infections and exposures to tobacco smoke and allergens early in life may play a part in the development of asthma.

Asthma can be difficult to diagnose, especially in children under the age of 5. In 2001, an estimated 6.3 million children in the United States had asthma, and 4.3 million had an asthma attack in the previous year. Asthma is the most common chronic disease in children and is one of the leading causes of missed school days.

# Asthma Triggers

Environmental exposures and certain conditions can make asthma worse and trigger asthma attacks. There are literally hundreds of potential triggers for asthma, but the triggers vary from person to person and are unique to each individual. Some common asthma triggers are exercise, allergens, inhaled irritants or viral infections. An individual can have problems with only one or a number of asthma triggers. Here are some examples of typical asthma triggers:

## ◆ Allergen Source

- ◆ Dust mites
- ◆ Cockroaches
- ◆ Animal dander
- ◆ Mold (indoor and outdoor)
- ◆ Pollen from trees, grasses and weeds

## ◆ Irritants

- ◆ Cigarette smoke
- ◆ Strong painting or cooking odors
- ◆ Perfume or scented products
- ◆ Cold air or a change in the weather (e.g. high humidity and thunderstorms)
- ◆ Air pollution

## ◆ Other triggers

- ◆ Physical exercise
- ◆ Aspirin and beta-blocker medicines
- ◆ Sulfites in food and beverages (e.g. dried fruits and wine)
- ◆ Respiratory infections
- ◆ Gastroesophageal reflux disease (GERD)
- ◆ Strong emotions (including crying or laughing hard)
- ◆ Stress

# Control of Asthma

Although asthma cannot currently be prevented or cured, exacerbations (asthma attacks) can be controlled. Taking medicine as prescribed, knowing the warning signs of an attack, avoiding asthma triggers and following the doctor's advice are essential to controlling asthma and preventing asthma attacks. Every person with asthma should have a written asthma action plan. The asthma action plan helps each person treat or manage asthma and its symptoms.



Medicines for asthma vary from person to person, and can be inhaled or taken as a pill. There are two basic types of asthma medicines – quick-relief (rescue) and long-term (controller) medicines. The quick-relief medicines are meant to help a person breathe

**Every person with asthma should have an asthma management plan**

during an asthma attack, while the long-term controller medicines are meant to prevent or reduce the number and severity of asthma attacks and do not help during an asthma attack. The proper and everyday use of long-term controller medicines should reduce the need to use the rescue medicines. A visit to the doctor is in order if there is a worsening of asthma symptoms and/or an increasing need for the use of rescue medicines.

When asthma is controlled, its symptoms are minimal or infrequent, which allows a person with asthma to lead an active life. When asthma is not controlled, it is likely that symptoms will cause missed days at school or work and possible visits to the hospital.

To reduce the burden of asthma, the goals for the control of asthma at both the national and state level include:

- ◆ Collecting and analyzing data on an ongoing basis
- ◆ Translating scientific information into public health programs and practices that will reduce the burden of asthma
- ◆ Involving all stakeholders in developing, implementing and evaluating asthma control program efforts
- ◆ Ultimately, the goals of the state and national asthma programs are to reduce the number of deaths, hospitalizations, emergency department visits, missed school or work days, and limitations on activity due to asthma

## Surveillance

Surveillance is a system for the on-going collection, analysis, interpretation and dissemination of health data. The purpose of surveillance is to monitor the impact and trends of a disease in order to guide the planning of disease management, intervention and control strategies. Although surveillance can be expensive, it is essential to targeting and evaluating efforts to reduce the burden of a disease, and even limited data are useful in guiding prevention and control efforts.

Initially, surveillance involves the collection of baseline data such as incidence, prevalence, severity and cost. These data provide the information necessary to understand the nature and scope of a disease so that a plan for control and prevention can be devised and implemented. As surveillance efforts continue over time, new data



can be compared to the baseline data. The impact of control and prevention efforts can be evaluated. On-going monitoring and evaluation helps ensure that effective strategies are continued and enhanced while ineffective strategies are changed or discontinued. Data on trends can also show where new intervention strategies are needed.

Asthma is a frequent cause of emergency department (ED) visits and hospitalizations and is also a very costly disease, in terms of direct and indirect financial costs as well as reduced quality of life. Surveillance is an important part of the public health effort to reduce the burden of asthma.

Because data are collected from a variety of sources such as state Medicaid programs, state mortality statistics, hospitalization records, surveys, etc., caution must be exercised when comparing data, since they may use different case definitions for asthma. The case definition is a set of conditions that must be met in order for a person to be counted as having asthma. Unlike *clinical* case definitions used to diagnose whether a person has a disease, *surveillance* case definitions can vary based on the nature of the data and the purpose for which it was collected.

For example, a case of asthma may be defined in these different ways:

1. Hospital discharge data may require asthma to be the discharge diagnosis or may count asthma as a co-morbid condition
2. Mortality data may require asthma to be the underlying cause of death or may count asthma as a contributing cause
3. Medicaid data may require paid claims for a service with a diagnosis of asthma or asthma medication prescriptions
4. Survey data may count respondents who say they currently have asthma or may count respondents who say that a health care professional has diagnosed them with asthma during their lifetime, even if they have not experienced any symptoms of asthma for many decades

There are asthma control programs at the national, state and local levels, each requiring surveillance targeted at specific populations of interest. Comparison of state and local disease estimates and patterns to each other as well as to national estimates helps define the scope of the problem of asthma. Such comparisons also provide a means to measure the potential positive effects of asthma education and management efforts.

The conceptual framework for asthma surveillance developed by the CDC provides for a system that collects and analyzes data in order to answer four basic questions:

#### **1. How much asthma is there?**

##### **◆ Behavioral Risk Factor Surveillance System (BRFSS)**

- ◆ Population based estimates of statewide prevalence

- ◆ Trends and disparities in asthma prevalence

- ◆ **Medicaid Administrative Claims Data**

- ◆ Prevalence rates in the Medicaid population, based on diagnostic codes and prescriptions filled in claims data.

## **2. How severe is the asthma?**

Surveillance of asthma is a public health activity, and strategies implemented to reduce the burden of asthma are directed at the population, rather than specific individuals with asthma. Indicators of the severity of asthma in a population include the morbidity and mortality associated with the asthma in that population. This is quite different from the clinical use of the term “severity” when used by a physician in reference to the determination of the level of an individual’s asthma symptoms.

### **Morbidity**

- ◆ **BRFSS**

- ◆ Asthma history module data on urgent care visits and routine care

- ◆ **Indiana Hospital Discharge Data**

- ◆ **Medicaid Data**

- ◆ Rates of inpatient, outpatient and emergency department visits due to asthma

- ◆ Rate of physician visits, prescription drug utilization

### **Mortality**

- ◆ **Indiana Mortality Statistics**

- ◆ Asthma as the underlying cause of death

- ◆ Trends and disparities in asthma mortality

## **3. How successful are we in managing asthma?**

- ◆ **Medicaid Data**

- ◆ Number of routine visits annually
- ◆ What asthma medicines patients receive

#### **4. What are the costs of asthma?**

##### **◆ Medicaid Data**

##### **◆ BRFSS**

- ◆ Quality of life indicators for people with asthma compared to those without asthma

At the state level, providing answers to these questions includes:

1. Determination of the extent of asthma in Indiana
  - a) The lifetime and current prevalence rates of asthma by age, sex, race/ethnicity
  - b) The incidence of asthma attacks by age, sex, race/ethnicity
2. Determination of the severity of asthma in Indiana
  - a) The number of asthma deaths
  - b) Number of hospitalizations due to asthma
  - c) Frequency of unscheduled visits to the emergency department, urgent care centers or other health care providers
  - d) Data on trends in the above measures of severity
3. Determination of the success of asthma management in Indiana
  - a) Information on use of prescription medicine
4. Determination of the cost of asthma in Indiana
  - a) Information on the cost of asthma care, i.e. medicines, ED visits, hospitalizations, scheduled and unscheduled visits to healthcare providers

- b) Information on quality of life for people with asthma
5. In addition, examination of environmental factors contributing to asthma
- a) Information on indoor air quality, tobacco use and environmental tobacco smoke exposure

# Asthma in Indiana

## Prevalence

### Behavioral Risk Factor Surveillance System

The Behavioral Risk Factor Surveillance System (BRFSS) is a random-digit dialed telephone survey of the non-institutionalized civilian population of the United States ages 18 and older. It was initiated by the Centers for Disease Control and Prevention (CDC) in 1984 to monitor state-level prevalence of major behavioral risks among adults associated with premature morbidity and mortality. The BRFSS is an ongoing data collection program administered annually by the CDC, and is the largest telephone survey in the world. All 50 states have participated in the BRFSS since 1994. Additional information on the BRFSS can be found at <http://www.cdc.gov/brfss/>.

The BRFSS consists of three parts. There is a standard core of questions that are included in the survey each year, and are used by all states. The states must ask the core questions without modification. There are also optional health behavior/risk factor modules and state-added questions that states can choose to utilize. The optional modules and questions can be costly and add length to the survey. It is not feasible to include questions on all the topics of interest each year, so states typically rotate the optional modules. There are two optional asthma modules. The first is an asthma history module that includes questions about the “severity” of asthma. The second asthma module is a childhood prevalence module that asks the number of children in the respondents’ households, if the children have ever been diagnosed with asthma and if they still have asthma.

**In 2002, an estimated 341,000 adults in Indiana over the age of 18 had asthma.**

**An estimated 514,000 adults in Indiana had been diagnosed with asthma during their lifetimes.**

*Source: CDC BRFSS 2002*

BRFSS data provide a means to estimate the lifetime and current prevalence of asthma in the adult population, and is a major source of prevalence data used by the Indiana

Asthma Program. Because the BRFSS is administered by the CDC, its results are consistent from state to state. The prevalence derived from the BRFSS for Indiana can be reliably compared to the prevalence of other states and the nation as a whole.

The BRFSS has a certain number of limitations. Only non-institutionalized adults with home telephones are included in the survey. Children under the age of 18, institutionalized adults, adults in the military service and adults without telephones are not included in the survey population. The prevalence rates derived from the BRFSS are based on a respondent's self-reported diagnoses of asthma. Since there is no confirmed case definition for a self-reported diagnosis of asthma, the BRFSS prevalence rates are based on probable cases of asthma.

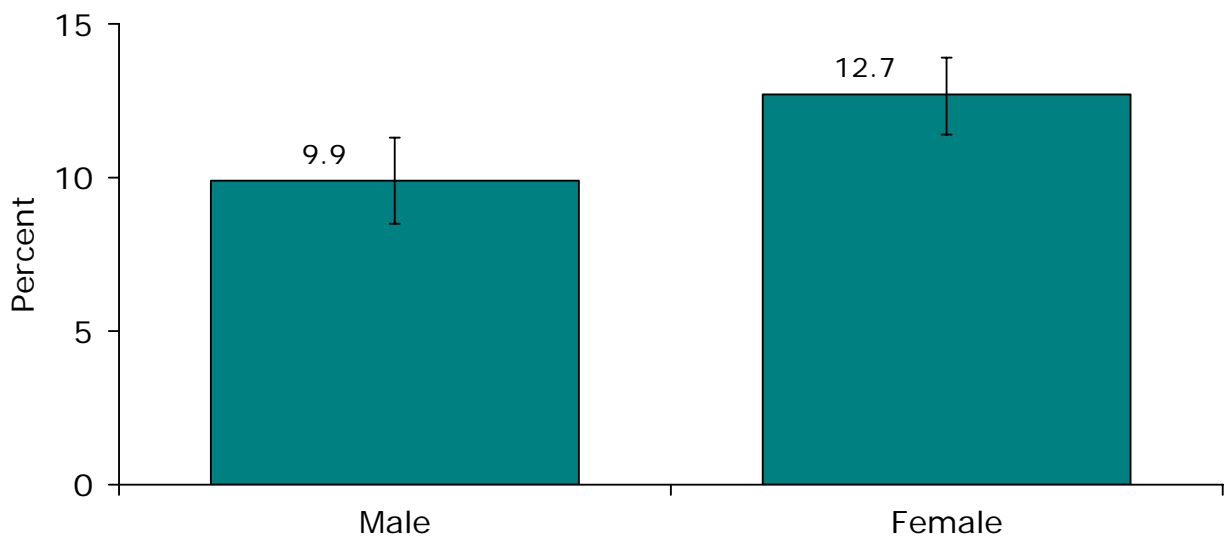
BRFSS data from 2002 show the prevalence of asthma in Indiana was comparable to the nationwide prevalence of asthma. No significant differences in prevalence were found among the age, sex, racial/ethnic or income categories between Indiana and the US as a whole.

In 2002, the lifetime prevalence of asthma in Indiana was **11.3%**, lower than the national prevalence of 11.8%, however the difference was not statistically significant. Lifetime prevalence was calculated from responses of "yes" to the question: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" The affirmative responses to this question provide information about those who reported they had ever been diagnosed with asthma at any time in their lives, even if they had not had any symptoms of asthma in many years.

In 2002, the current prevalence of asthma in Indiana was the same as the prevalence for the United States as a whole, **7.5%**. Current asthma prevalence was calculated from responses of "yes" not only to the question: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" but also a response of "yes" to the question: "Do you still have asthma?" The affirmative responses to both asthma questions provides information about those with current asthma who are incurring the financial costs of asthma as well as the morbidity and mortality associated with the asthma. Targeting interventions aimed at the improvement of the control of asthma requires knowledge of those who are currently suffering from the disease.

**Figure 1 Lifetime asthma prevalence by sex:  
Indiana 2002**

Source: BRFSS 2002

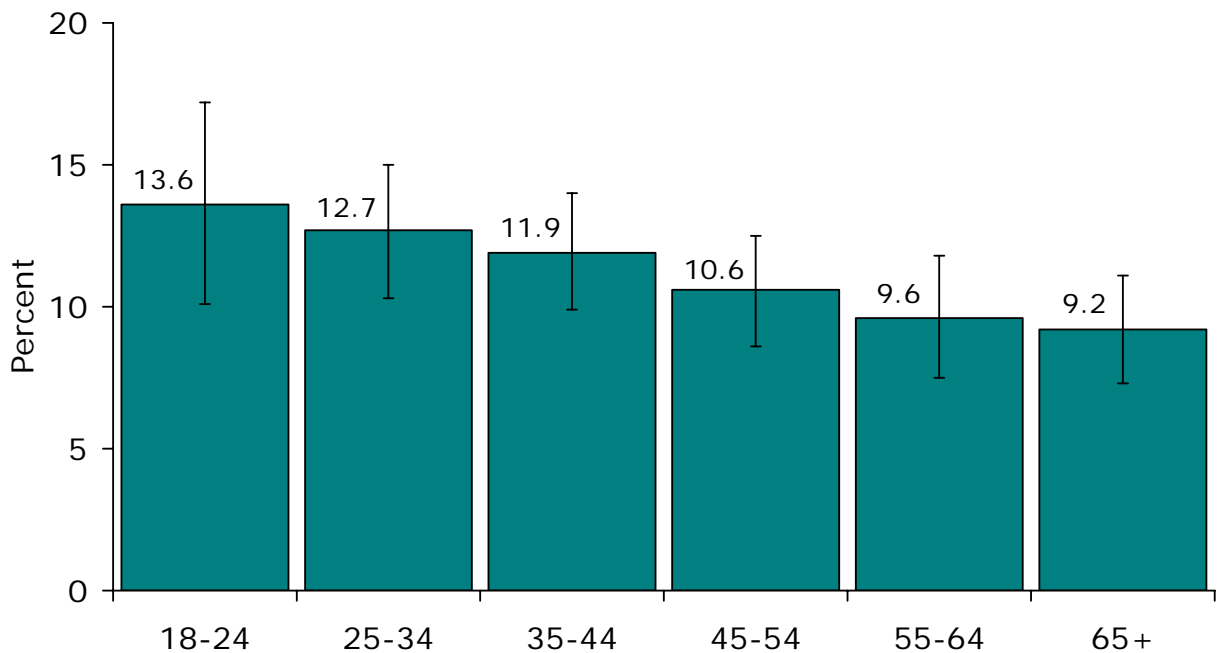


Percentage of respondents within each category who answered "yes" to the question: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?"

Note: I = 95% Confidence Interval.

**Figure 2 Lifetime asthma prevalence by age:  
Indiana 2002**

Source: BRFSS 2002

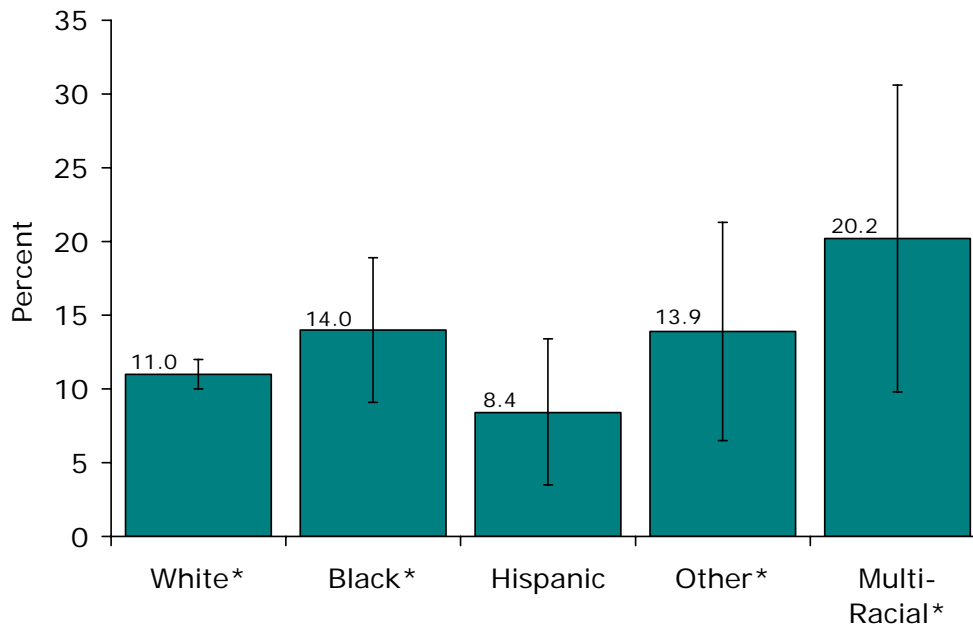


Percentage of respondents within each category who answered "yes" to the question: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?"

Note: I = 95% Confidence Interval.

**Figure 3 Lifetime asthma prevalence by race/ethnicity:  
Indiana 2002**

Source: BRFSS 2002



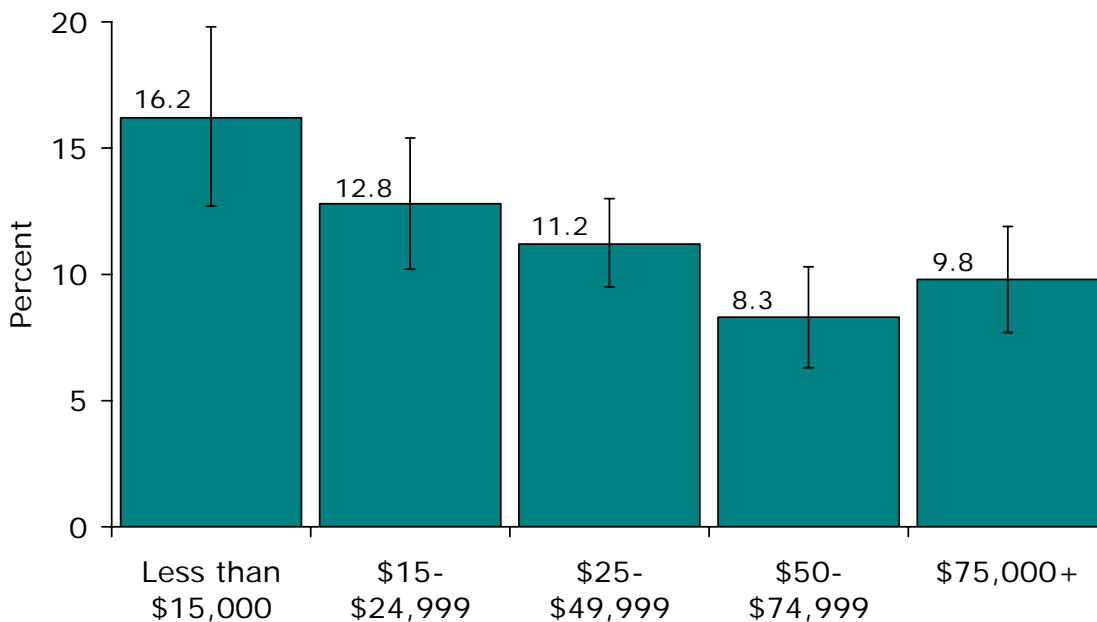
\* Non-Hispanic

Percentage of respondents within each category who answered "yes" to the question: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?"

Note: I = 95% Confidence Interval

**Figure 4 Lifetime asthma prevalence by annual household income:  
Indiana 2002**

Source: BRFSS 2002

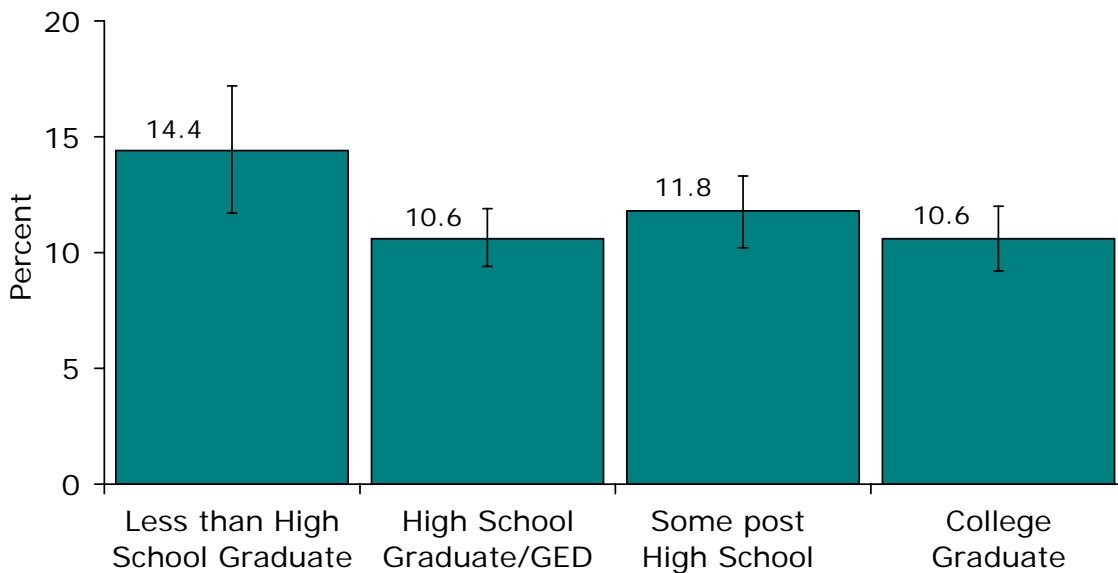


Percentage of respondents within each category who answered "yes" to the question: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?"

Note: I = 95% Confidence Interval.

**Figure 5 Lifetime asthma prevalence by educational attainment: Indiana 2002**

*Source: BRFSS 2002*



*Percentage of respondents within each category who answered "yes" to the question: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?"*

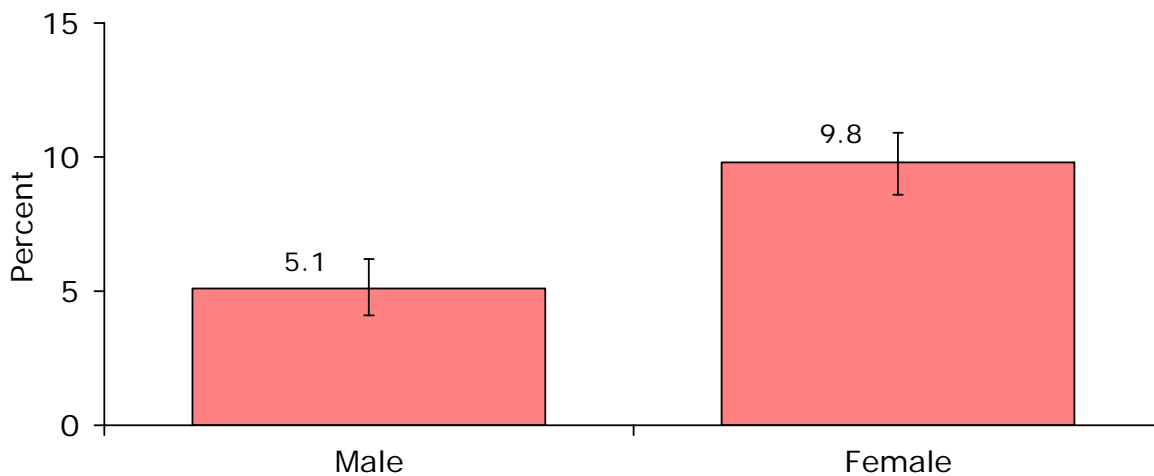
*Note: I = 95% Confidence Interval.*

Responses of those with current asthma were examined in greater detail. Those with current asthma are those seen in the healthcare system for asthma treatment, incur direct costs for medicines, medical visits and hospitalizations, as well as suffer the negative impact of asthma to their quality of life.



**Figure 6 Current asthma prevalence by sex:  
Indiana 2002**

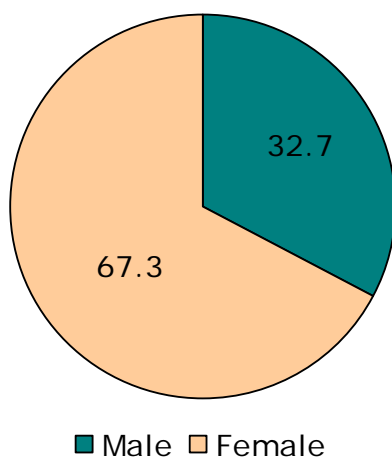
Source: BRFSS 2002



Percentage of respondents within each category who answered "yes" to the questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"  
Note: I = 95% Confidence Interval.

**Figure 7 Sex, percent distribution in respondents with current asthma: Indiana 2002**

Source: BRFSS 2002



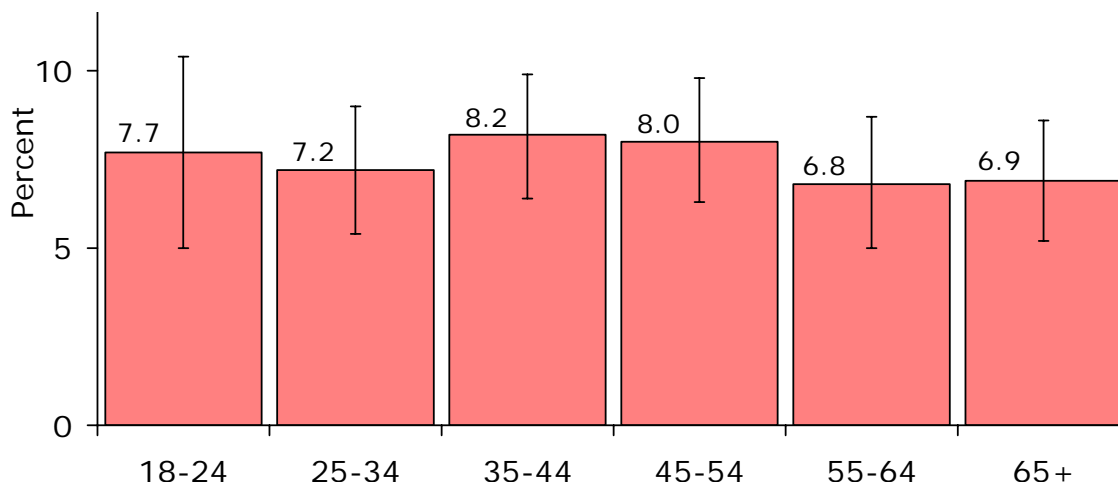
### Adults with Current Asthma

Percentage breakdown of categories within survey population of respondents with current asthma.

Survey population of adults with current asthma are respondents who answered "yes" to **both** asthma core questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"

**Figure 8 Current asthma prevalence by age:  
Indiana 2002**

Source: BRFSS 2002

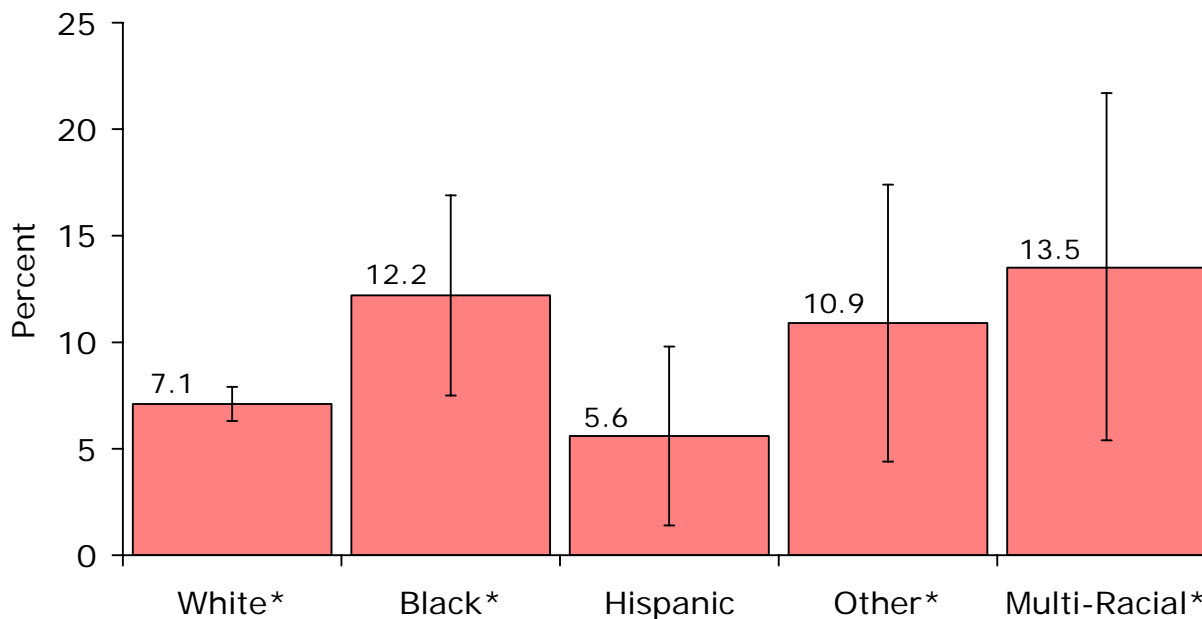


Percentage of respondents within each category who answered "yes" to the questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"

Note: I = 95% Confidence Interval

**Figure 9 Current asthma prevalence by race/ethnicity:  
Indiana 2002**

Source: BRFSS 2002



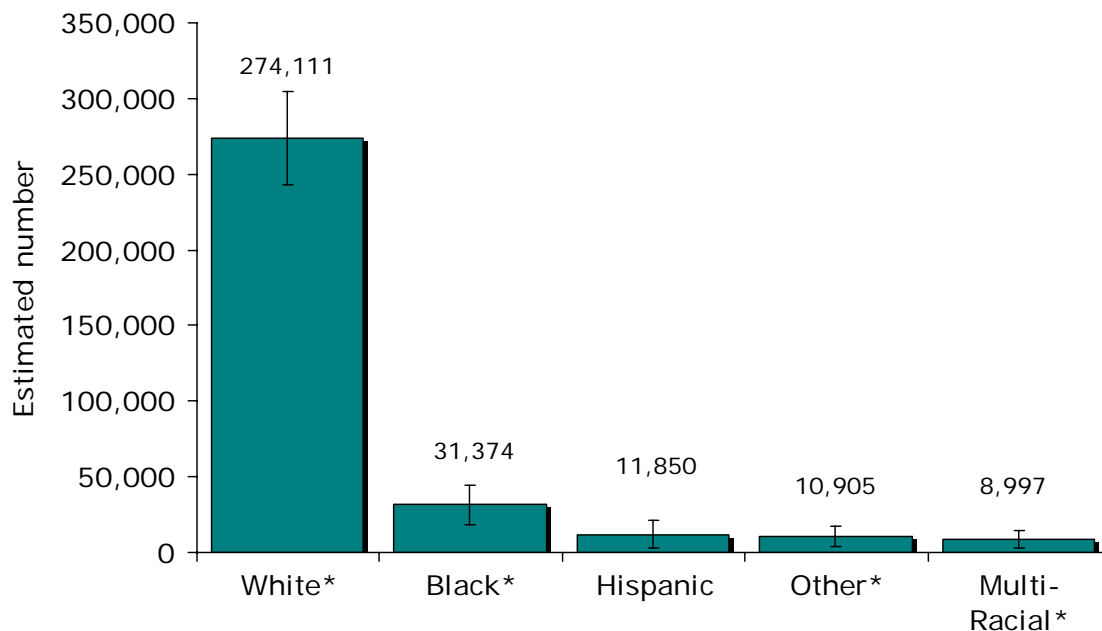
\* Non-Hispanic

Percent of respondents within each category who answered "yes" to the questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"

Note: I = 95% Confidence Interval

**Figure 10 Adults with current asthma by race/ethnicity:  
Indiana 2002**

Source: BRFSS 2002



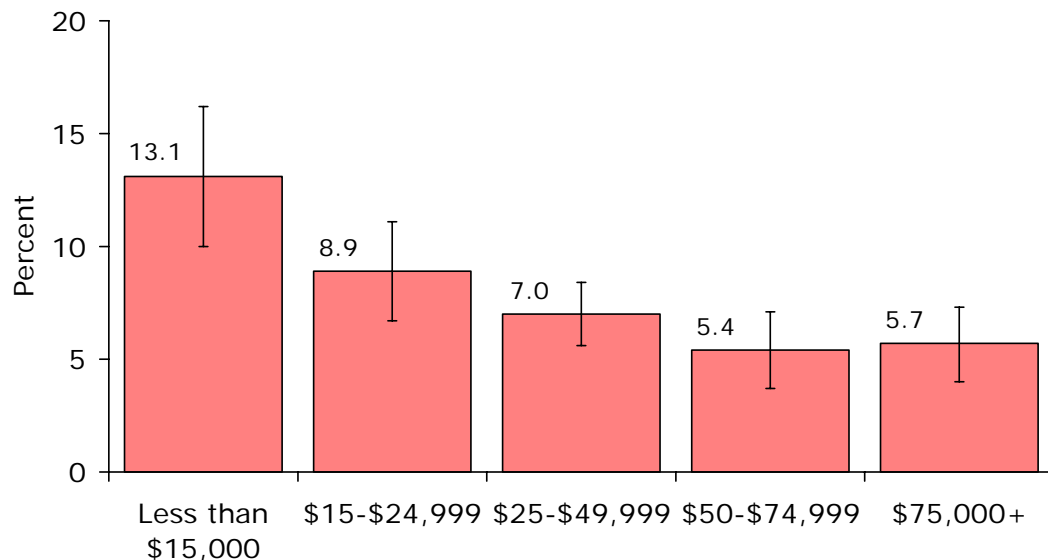
\* Non-Hispanic

Estimated number of adults in Indiana with current asthma in 2002. Estimated counts are based on U.S. Department of the Census July 1, 2002 population estimates for the State of Indiana and BRFSS current asthma prevalence estimates by racial/ethnic category.

Note: I = 95% Confidence Interval

**Figure 11 Current asthma prevalence by annual household income:  
Indiana 2002**

Source: BRFSS 2002

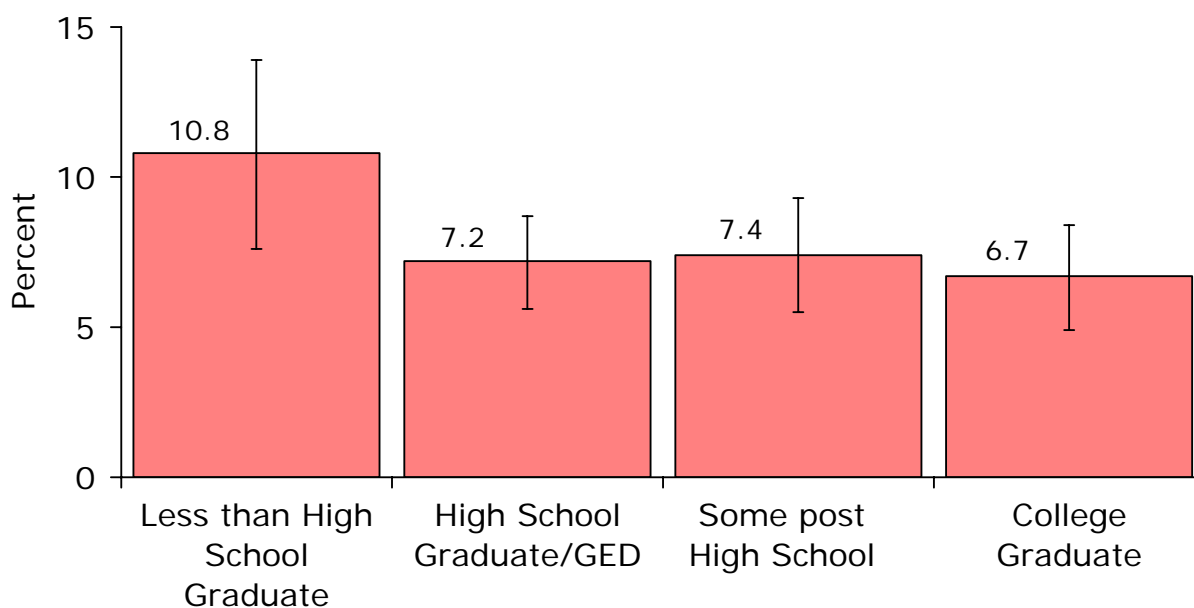


Percent of respondents within each category who answered "yes" to the question: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"

Note: I = 95% Confidence Interval

**Figure 12 Current asthma prevalence by educational attainment:  
Indiana 2002**

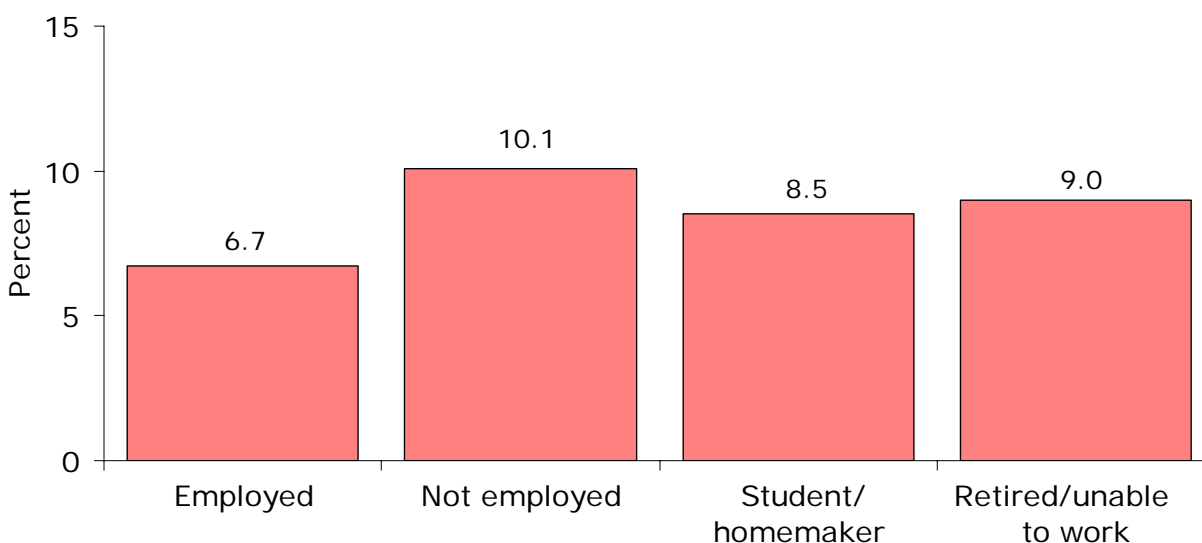
Source: BRFSS 2002



Percentage of respondents within each category who answered "yes" to the questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"  
Note: I = 95% Confidence Interval.

**Figure 13 Current asthma prevalence by employment status:  
Indiana 2002**

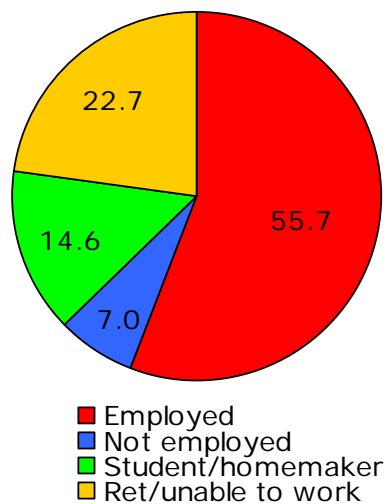
Source: Indiana BRFSS 2002



Percentage of respondents within each category who answered "yes" to the questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"

**Figure 14 Employment status, percent distribution in respondents with current asthma: Indiana 2002**

Source: Indiana BRFSS 2002



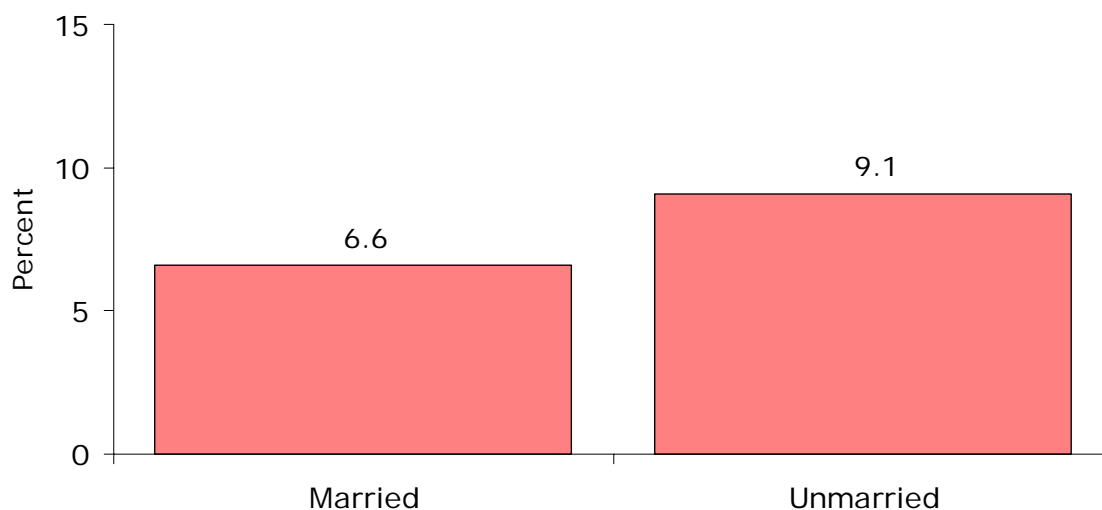
#### Adults with Current Asthma

Percentage breakdown of categories within survey population of respondents with current asthma.

Survey population of adults with current asthma are respondents who answered "yes" to **both** asthma core questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"

**Figure 15 Current asthma prevalence by marital status: Indiana 2002**

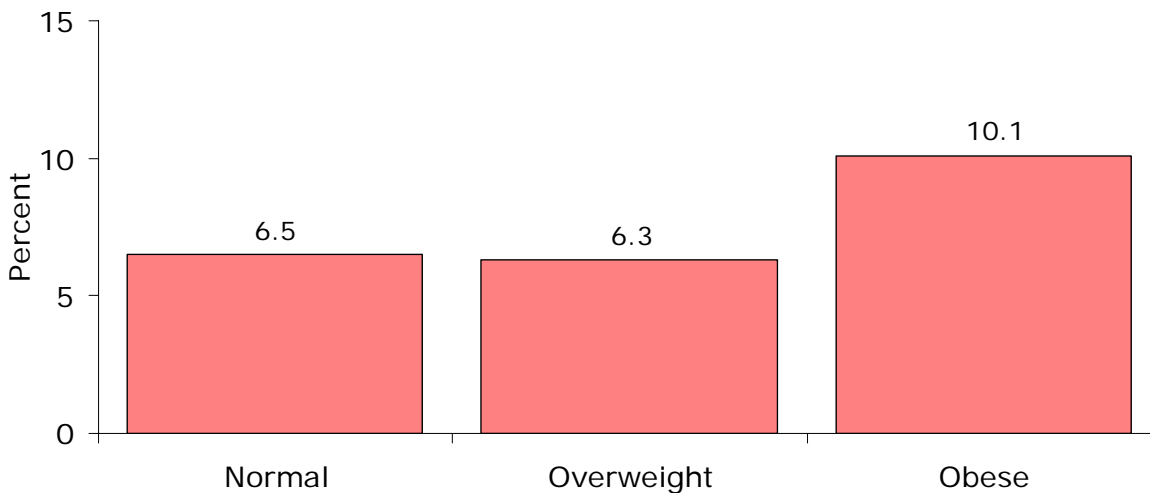
Source: Indiana BRFSS 2002



Percentage of respondents within each category who answered "yes" to the questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"

**Figure 16 Current asthma prevalence by BMI category:  
Indiana 2002**

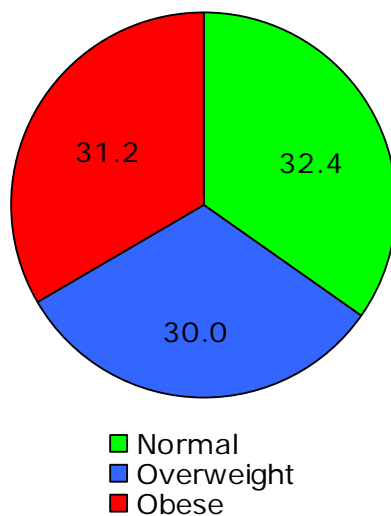
Source: BRFSS 2002



Percentage of respondents within each category who answered "yes" to the questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"

**Figure 17 BMI category, percent distribution in respondents with  
current asthma: Indiana 2002**

Source: BRFSS 2002



#### Adults with Current Asthma

Percentage breakdown of categories within survey population of respondents with current asthma.

Survey population of adults with current asthma are respondents who answered "yes" to **both** asthma core questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"

Obesity has been associated with a number of chronic diseases, including asthma. Body mass index (BMI) is calculated from height and weight data, and used to assess underweight, normal weight, overweight and obesity. In adults 18 and older, a BMI below 18.5 is classified as underweight; a BMI between 19 and 24.9 is classified as normal weight; a BMI between 25 and 29.5 is classified as overweight and a BMI of 30 or greater is classified as obese.

In 2001, Indiana BRFSS survey data indicated that 30.1% of people with asthma were diagnosed before the age of 10. The pattern of age at diagnosis is different for males and females. Their ages at diagnosis correspond to the fact that until puberty, nearly twice as many boys as girls have asthma though after puberty and throughout the rest of the lifespan more women than men have asthma.

According to the 2002 BRFSS survey, 15.7% of Indiana households have at least one child who has ever been diagnosed with asthma. Of those households, 71.8% reported at least one child who currently has asthma.

Asthma is one of the most common chronic disease of childhood and responsible for more missed school days than any other illness. In children, the prevalence of asthma is higher in boys than girls. At puberty, the gender ratio reverses and the prevalence of asthma becomes greater in girls than boys. This gender difference in prevalence remains through adulthood.

## **Medicaid**

The Medicaid program is a joint program with costs shared by both federal and state governments. Medicaid is the primary source of health care coverage for low income families and elderly and disabled people. More than half of all Medicaid enrollees are children, making it the largest public provider of children's health insurance nationwide.

- ◆ Nationwide, more than half of all Medicaid enrollees are children
- ◆ In Indiana in 2003, 478,000 children were enrolled in Medicaid at some time during the year. This number represents 28% of all children.

The source of the Medicaid claims and enrollment data for the State of Indiana was the Indiana Office of Medicaid Policy and Planning (OMPP). The data were analyzed and provided by Indiana Children's Health Services Research (HSR), a research section of the Department of Pediatrics at Indiana University School of Medicine. The Medicaid sample included clinic, ER, hospital and pharmacy claims from Medicaid enrollees. The Medicaid figures exclude people who are 65 and older. We report prevalence figures using individuals who were in Medicaid for at least 11 of 12 months (that is, "continuously enrolled"). HSR used the following two case definitions: for persistent asthma, the NCQA/HEDIS criteria (except the enrollment requirement, which was shortened to the same continuous enrollment of at least 11 of 12 months as that of the rest of the cohort); for any asthma, HSR employed a definition that is currently being used by the Indiana

Office of Medicaid Policy and Planning (OMPP) in its Indiana Chronic Disease Management Program. The latter definition is any ICD-9 Diagnostic Code of 493.0-493.9 or at least 3 prescriptions for asthma medicine(s) during State Fiscal Year 2003.

Many large counties in Indiana have mandatory risk-based managed care for children in Medicaid; thus, the Medicaid prevalence figures are based on a combination of all available paid claims and all available risk-based “shadow” claims with service dates during the year of interest. Because of underreporting of risk-based claims, the prevalence figures for the large counties are probably underestimated. Risk-based “shadow claims” were excluded from the analyses of inhaled steroid use, office visits and costs, so these aggregate utilization figures would not be substantial underestimates.

**Table 1 Sex distribution of those with asthma in Medicaid for at least 11 of 12 months in FY 2003**

*Source: OMPP*

| Sex    | N      | %    |
|--------|--------|------|
| Female | 31,884 | 54%  |
| Male   | 26,964 | 46%  |
| Total  | 58,848 | 100% |

**Table 2 Asthma prevalence by sex: those in Medicaid for at least 11 of 12 months in FY 2003\***

*Source: OMPP*

| Sex    | N with asthma | Total N in Medicaid | Prevalence |
|--------|---------------|---------------------|------------|
| Female | 31,884        | 282,847             | 11.3%      |
| Male   | 26,964        | 226,741             | 11.9%      |
| Total  | 58,848        | 509,588             | 11.5%      |

*\*Note: These prevalence estimates might reflect underreporting of risk-based managed care “shadow” claims in large counties (e.g. Marion County).*

**Table 3 Race/ethnicity distribution of those with asthma in Medicaid for at least 11 of 12 months in FY 2003**

*Source: OMPP*

| Race             | N      | %    |
|------------------|--------|------|
| Hispanic         | 2363   | 4%   |
| African-American | 13,064 | 22%  |
| White            | 42,840 | 73%  |
| Other            | 581    | 1%   |
| Total            | 58,848 | 100% |



**Table 4 Asthma prevalence by race/ethnicity: those in Medicaid for at least 11 of 12 months in FY 2003\***

Source: OMPP

| Race             | N with asthma | Total N in Medicaid | Prevalence |
|------------------|---------------|---------------------|------------|
| Hispanic         | 2,363         | 32,999              | 7.2%       |
| African-American | 13,064        | 130,160             | 10.0%      |
| White            | 42,840        | 339,699             | 12.6%      |
| Other            | 581           | 6,730               | 8.6%       |
| Total            | 58,848        | 509,588             | 11.5%      |

*\*Note: These prevalence estimates might reflect underreporting of risk-based managed care “shadow” claims in large counties (e.g. Marion County).*

**Table 5 Number and prevalence of asthma in Medicaid cohort, All ages, by county: Indiana FY 2003**

Source: OMPP

*Note: The number/prevalence estimates for large counties, e.g. Marion County, may be artificially low due to shadow claims.*

| County      | N with one dx or three Rx's in FY'03 | N in Medicaid in June 2003 | Prevalence |
|-------------|--------------------------------------|----------------------------|------------|
| Adams       | 227                                  | 1640                       | 12.2%      |
| Allen       | 2988                                 | 25,067                     | 10.7%      |
| Bartholomew | 737                                  | 4325                       | 14.6%      |
| Benton      | 75                                   | 571                        | 11.6%      |
| Blackford   | 147                                  | 1306                       | 10.1%      |
| Boone       | 249                                  | 1641                       | 13.2%      |
| Brown       | 128                                  | 909                        | 12.3%      |
| Carroll     | 115                                  | 880                        | 11.6%      |
| Cass        | 394                                  | 3391                       | 10.4%      |
| Clark       | 995                                  | 6201                       | 13.8%      |
| Clay        | 355                                  | 2142                       | 14.2%      |
| Clinton     | 245                                  | 2413                       | 9.2%       |
| Crawford    | 143                                  | 1186                       | 10.8%      |
| Davies      | 535                                  | 2564                       | 17.3%      |
| Dearborn    | 239                                  | 2233                       | 9.7%       |
| Decatur     | 250                                  | 1502                       | 14.3%      |
| DeKalb      | 267                                  | 2151                       | 11.0%      |
| Delaware    | 1613                                 | 9682                       | 14.3%      |
| Dubois      | 186                                  | 1621                       | 10.3%      |
| Elkhart     | 1099                                 | 13,996                     | 7.3%       |
| Fayette     | 387                                  | 2434                       | 13.7%      |
| Floyd       | 847                                  | 4865                       | 14.8%      |

|            |      |        |       |
|------------|------|--------|-------|
| Fountain   | 156  | 1222   | 11.3% |
| Franklin   | 173  | 1403   | 11.0% |
| Fulton     | 234  | 1584   | 12.9% |
| Gibson     | 202  | 2029   | 9.1%  |
| Grant      | 967  | 6880   | 12.3% |
| Greene     | 455  | 2791   | 14.0% |
| Hamilton   | 517  | 3903   | 11.7% |
| Hancock    | 280  | 1968   | 12.5% |
| Harrison   | 279  | 2163   | 11.4% |
| Hendricks  | 350  | 2573   | 12.0% |
| Henry      | 553  | 3899   | 12.4% |
| Howard     | 1043 | 6201   | 14.4% |
| Huntington | 377  | 2060   | 15.5% |
| Jackson    | 360  | 2177   | 14.2% |
| Jasper     | 164  | 1723   | 8.7%  |
| Jay        | 270  | 1523   | 15.1% |
| Jefferson  | 468  | 2279   | 17.0% |
| Jennings   | 384  | 2285   | 14.4% |
| Johnson    | 736  | 4788   | 15.4% |
| Knox       | 602  | 3716   | 13.9% |
| Kosciusko  | 394  | 3631   | 9.8%  |
| LaGrange   | 106  | 1055   | 9.1%  |
| Lake       | 6354 | 52,168 | 10.9% |
| LaPorte    | 1304 | 8056   | 13.9% |
| Lawrence   | 687  | 3334   | 17.1% |
| Madison    | 1777 | 10,942 | 14.0% |
| Marion     | 9691 | 86,866 | 10.0% |
| Marshall   | 264  | 2627   | 9.1%  |
| Martin     | 162  | 937    | 14.7% |
| Miami      | 384  | 2770   | 12.2% |
| Monroe     | 1112 | 5937   | 15.8% |
| Montgomery | 445  | 2397   | 15.7% |
| Morgan     | 615  | 4181   | 12.8% |
| Newton     | 99   | 894    | 10.0% |
| Noble      | 265  | 2327   | 10.2% |
| Ohio       | 42   | 257    | 14.0% |
| Orange     | 308  | 2146   | 12.6% |
| Owen       | 309  | 1962   | 13.6% |
| Parke      | 168  | 1398   | 10.7% |
| Perry      | 151  | 1161   | 11.5% |
| Pike       | 124  | 1007   | 11.0% |
| Porter     | 880  | 6548   | 11.8% |
| Posey      | 198  | 1470   | 11.9% |
| Pulaski    | 129  | 1029   | 11.1% |
| Putnam     | 241  | 2060   | 10.5% |

|             |        |         |       |
|-------------|--------|---------|-------|
| Randolph    | 317    | 2077    | 13.2% |
| Ripley      | 230    | 1627    | 12.4% |
| Rush        | 145    | 1154    | 11.2% |
| St. Joseph  | 1972   | 23,472  | 7.8%  |
| Scott       | 357    | 2535    | 12.3% |
| Shelby      | 471    | 2405    | 16.4% |
| Spencer     | 135    | 1091    | 11.0% |
| Starke      | 290    | 2302    | 11.2% |
| Steuben     | 209    | 1717    | 10.9% |
| Sullivan    | 311    | 1908    | 14.0% |
| Switzerland | 105    | 622     | 14.4% |
| Tippecanoe  | 1058   | 7758    | 12.0% |
| Tipton      | 117    | 618     | 15.9% |
| Union       | 66     | 479     | 12.1% |
| Vanderburgh | 2019   | 14,701  | 12.1% |
| Vermillion  | 180    | 1195    | 13.1% |
| Vigo        | 1524   | 9863    | 13.4% |
| Wabash      | 346    | 2394    | 12.6% |
| Warren      | 63     | 463     | 12.0% |
| Warrick     | 263    | 2422    | 9.8%  |
| Washington  | 296    | 2381    | 11.1% |
| Wayne       | 796    | 6162    | 11.4% |
| Wells       | 231    | 1180    | 16.4% |
| White       | 208    | 1880    | 10.0% |
| Whitley     | 139    | 1287    | 9.7%  |
| Total       | 58,848 | 509,588 | 11.5% |

**Table 6 Number and prevalence of asthma in a Medicaid cohort of children age 0 – 17 years, by County:  
Indiana Medicaid FY 2003**

Source: OMPP

Note: The number/prevalence estimates for large counties, e.g. Marion County, may be artificially low due to shadow claims.

| County      | N with one dx or three Rx's in FY'03 | N in Medicaid in June 2003 | Prevalence |
|-------------|--------------------------------------|----------------------------|------------|
| Adams       | 149                                  | 1,277                      | 11.7       |
| Allen       | 2,072                                | 19,776                     | 10.5       |
| Bartholomew | 413                                  | 3,466                      | 11.9       |
| Benton      | 44                                   | 486                        | 9.1        |
| Blackford   | 75                                   | 949                        | 7.9        |
| Boone       | 161                                  | 1,300                      | 12.4       |
| Brown       | 75                                   | 748                        | 10.0       |
| Carroll     | 77                                   | 730                        | 10.5       |



|            |       |        |      |
|------------|-------|--------|------|
| Cass       | 219   | 2,544  | 8.6  |
| Clark      | 500   | 4,690  | 10.7 |
| Clay       | 201   | 1,678  | 12.0 |
| Clinton    | 150   | 1,925  | 7.8  |
| Crawford   | 52    | 878    | 5.9  |
| Davies     | 346   | 2,013  | 17.2 |
| Dearborn   | 124   | 1,636  | 7.6  |
| Decatur    | 159   | 1,180  | 13.5 |
| DeKalb     | 172   | 1,706  | 10.1 |
| Delaware   | 966   | 7,293  | 13.2 |
| Dubois     | 116   | 1,204  | 9.6  |
| Elkhart    | 635   | 10,901 | 5.8  |
| Fayette    | 224   | 1,744  | 12.8 |
| Floyd      | 501   | 3,546  | 14.1 |
| Fountain   | 95    | 980    | 9.7  |
| Franklin   | 104   | 1,066  | 9.8  |
| Fulton     | 157   | 1,318  | 11.9 |
| Gibson     | 107   | 1,506  | 7.1  |
| Grant      | 586   | 5,238  | 11.2 |
| Greene     | 264   | 2,259  | 11.7 |
| Hamilton   | 310   | 3,150  | 9.8  |
| Hancock    | 159   | 1,500  | 10.6 |
| Harrison   | 146   | 1,593  | 9.2  |
| Hendricks  | 246   | 2,157  | 11.4 |
| Henry      | 294   | 2,882  | 10.2 |
| Howard     | 612   | 4,817  | 12.7 |
| Huntington | 277   | 1,725  | 16.1 |
| Jackson    | 205   | 1,740  | 11.8 |
| Jasper     | 96    | 1,330  | 7.2  |
| Jay        | 164   | 1,262  | 13.0 |
| Jefferson  | 273   | 1,797  | 15.2 |
| Jennings   | 269   | 1,812  | 14.8 |
| Johnson    | 420   | 3,735  | 11.2 |
| Knox       | 310   | 2,615  | 11.9 |
| Kosciusko  | 254   | 2,873  | 8.8  |
| LaGrange   | 51    | 800    | 6.4  |
| Lake       | 4,162 | 39,679 | 10.5 |
| LaPorte    | 864   | 6,528  | 13.2 |
| Lawrence   | 442   | 2,716  | 16.3 |
| Madison    | 989   | 8,465  | 11.7 |
| Marion     | 6,684 | 69,373 | 9.6  |
| Marshall   | 164   | 2,075  | 7.9  |
| Martin     | 101   | 749    | 13.5 |
| Miami      | 222   | 2,169  | 10.2 |
| Monroe     | 728   | 4,726  | 15.4 |

|             |              |         |              |
|-------------|--------------|---------|--------------|
| Montgomery  | 304          | 1,913   | 15.9         |
| Morgan      | 375          | 3,248   | 11.5         |
| Newton      | 43           | 668     | 6.4          |
| Noble       | 150          | 1,775   | 8.5          |
| Ohio        | less than 40 | 200     | not reported |
| Orange      | 175          | 1,565   | 11.2         |
| Owen        | 204          | 1,642   | 12.4         |
| Parke       | 88           | 971     | 9.1          |
| Perry       | 78           | 820     | 9.5          |
| Pike        | 60           | 734     | 8.2          |
| Porter      | 522          | 5,017   | 10.4         |
| Posey       | 102          | 1,091   | 9.3          |
| Pulaski     | 67           | 786     | 8.5          |
| Putnam      | 155          | 1,614   | 9.6          |
| Randolph    | 202          | 1,704   | 11.9         |
| Ripley      | 118          | 1,264   | 9.3          |
| Rush        | 78           | 894     | 8.7          |
| St. Joseph  | 178          | 1,787   | 10.0         |
| Scott       | 279          | 1,892   | 14.7         |
| Shelby      | 67           | 839     | 8.0          |
| Spencer     | 1,192        | 18,281  | 6.5          |
| Starke      | 183          | 1,764   | 10.4         |
| Steuben     | 119          | 1,371   | 8.7          |
| Sullivan    | 182          | 1,481   | 12.3         |
| Switzerland | 40           | 469     | 8.5          |
| Tippecanoe  | 643          | 6,160   | 10.4         |
| Tipton      | 72           | 475     | 15.2         |
| Union       | less than 40 | 383     | not reported |
| Vanderburgh | 1,104        | 11,008  | 10.0         |
| Vermillion  | 104          | 934     | 11.1         |
| Vigo        | 811          | 7,550   | 10.7         |
| Wabash      | 217          | 1,817   | 11.9         |
| Warren      | less than 40 | 373     | not reported |
| Warrick     | 158          | 1,882   | 8.4          |
| Washington  | 159          | 1,734   | 9.2          |
| Wayne       | 439          | 4,621   | 9.5          |
| Wells       | 135          | 988     | 13.7         |
| White       | 131          | 1,528   | 8.6          |
| Whitley     | 89           | 953     | 9.3          |
| Total       | 36,308       | 350,501 | 10.4         |

**Table 7     Number and prevalence of asthma in a Medicaid cohort of adults age 18 – 64 years, by County:  
Indiana Medicaid FY 2003**

*Source: OMPP*

*Note: The number/prevalence estimates for large counties, e.g. Marion County, may be artificially low due to shadow claims.*

| County      | N with one dx or three Rx's in FY'03 | N in Medicaid in June 2003 | Prevalence   |
|-------------|--------------------------------------|----------------------------|--------------|
| Adams       | 78                                   | 590                        | 13.2         |
| Allen       | 916                                  | 8,279                      | 11.1         |
| Bartholomew | 324                                  | 1,596                      | 20.3         |
| Benton      | less than 40                         | 160                        | not reported |
| Blackford   | 72                                   | 504                        | 14.3         |
| Boone       | 88                                   | 590                        | 14.9         |
| Brown       | 53                                   | 289                        | 18.3         |
| Carroll     | less than 40                         | 265                        | not reported |
| Cass        | 175                                  | 1,241                      | 14.1         |
| Clark       | 495                                  | 2,506                      | 19.8         |
| Clay        | 154                                  | 819                        | 18.8         |
| Clinton     | 95                                   | 733                        | 13.0         |
| Crawford    | 91                                   | 451                        | 20.2         |
| Davies      | 189                                  | 1,086                      | 17.4         |
| Dearborn    | 115                                  | 836                        | 13.8         |
| Decatur     | 91                                   | 572                        | 15.9         |
| DeKalb      | 95                                   | 712                        | 13.3         |
| Delaware    | 647                                  | 4,002                      | 16.2         |
| Dubois      | 70                                   | 603                        | 11.6         |
| Elkhart     | 464                                  | 4,194                      | 11.1         |
| Fayette     | 163                                  | 1,077                      | 15.1         |
| Floyd       | 346                                  | 2,166                      | 16.0         |
| Fountain    | 61                                   | 398                        | 15.3         |
| Franklin    | 69                                   | 510                        | 13.5         |
| Fulton      | 77                                   | 500                        | 15.4         |
| Gibson      | 95                                   | 725                        | 13.1         |
| Grant       | 381                                  | 2,609                      | 14.6         |
| Greene      | 191                                  | 987                        | 19.4         |
| Hamilton    | 207                                  | 1,270                      | 16.3         |
| Hancock     | 121                                  | 748                        | 16.2         |
| Harrison    | 133                                  | 849                        | 15.7         |
| Hendricks   | 104                                  | 766                        | 13.6         |
| Henry       | 259                                  | 1,570                      | 16.5         |
| Howard      | 431                                  | 2,427                      | 17.8         |
| Huntington  | 100                                  | 712                        | 14.0         |
| Jackson     | 155                                  | 797                        | 19.4         |

|             |              |        |              |
|-------------|--------------|--------|--------------|
| Jasper      | 68           | 557    | 12.2         |
| Jay         | 106          | 531    | 20.0         |
| Jefferson   | 195          | 950    | 20.5         |
| Jennings    | 115          | 857    | 13.4         |
| Johnson     | 316          | 1,789  | 17.7         |
| Knox        | 292          | 1,703  | 17.1         |
| Kosciusko   | 140          | 1,152  | 12.2         |
| LaGrange    | 55           | 361    | 15.2         |
| Lake        | 2,192        | 18,843 | 11.6         |
| LaPorte     | 440          | 2,832  | 15.5         |
| Lawrence    | 245          | 1,305  | 18.8         |
| Madison     | 788          | 4,254  | 18.5         |
| Marion      | 3,007        | 27,184 | 11.1         |
| Marshall    | 100          | 816    | 12.3         |
| Martin      | 61           | 350    | 17.4         |
| Miami       | 162          | 985    | 16.4         |
| Monroe      | 384          | 2,323  | 16.5         |
| Montgomery  | 141          | 929    | 15.2         |
| Morgan      | 240          | 1,548  | 15.5         |
| Newton      | 56           | 325    | 17.2         |
| Noble       | 115          | 817    | 14.1         |
| Ohio        | less than 40 | 99     | not reported |
| Orange      | 133          | 889    | 15.0         |
| Owen        | 105          | 629    | 16.7         |
| Parke       | 80           | 595    | 13.4         |
| Perry       | 73           | 492    | 14.8         |
| Pike        | 64           | 397    | 16.1         |
| Porter      | 358          | 2,411  | 14.8         |
| Posey       | 96           | 577    | 16.6         |
| Pulaski     | 62           | 372    | 16.7         |
| Putnam      | 86           | 687    | 12.5         |
| Randolph    | 115          | 690    | 16.7         |
| Ripley      | 112          | 593    | 18.9         |
| Rush        | 67           | 405    | 16.5         |
| St. Joseph  | 179          | 1,105  | 16.2         |
| Scott       | 192          | 984    | 19.5         |
| Shelby      | 68           | 387    | 17.6         |
| Spencer     | 780          | 7,163  | 10.9         |
| Starke      | 107          | 828    | 12.9         |
| Steuben     | 90           | 555    | 16.2         |
| Sullivan    | 129          | 738    | 17.5         |
| Switzerland | 65           | 258    | 25.2         |
| Tippecanoe  | 415          | 2,656  | 15.6         |
| Tipton      | 45           | 260    | 17.3         |
| Union       | less than 40 | 162    | not reported |

|             |              |         |              |
|-------------|--------------|---------|--------------|
| Vanderburgh | 915          | 5,712   | 16.0         |
| Vermillion  | 76           | 441     | 17.2         |
| Vigo        | 713          | 3,837   | 18.6         |
| Wabash      | 129          | 923     | 14.0         |
| Warren      | less than 40 | 153     | not reported |
| Warrick     | 105          | 803     | 13.1         |
| Washington  | 137          | 943     | 14.5         |
| Wayne       | 357          | 2,337   | 15.3         |
| Wells       | 96           | 423     | 22.7         |
| White       | 77           | 560     | 13.8         |
| Whitley     | 50           | 473     | 10.6         |
| Total       | 22,540       | 159,087 | 14.2         |

## Measures of Severity

### Morbidity

The following statistics are derived from responses to the BRFSS optional asthma history module, which was included in Indiana's BRFSS survey in 2001. The asthma history module asked a number of survey questions that dealt with the severity of asthma. All respondents to this module had answered "yes" to the lifetime asthma core question in the BRFSS survey, indicating they had been told by a doctor, nurse or other health care professional that they had asthma.

#### ***Asthma symptoms***

- ◆ 42.6% of the respondents reported having asthma symptoms on less than 1 day in the past month.
- ◆ 17.3% of the respondents reported having asthma symptoms every day.

#### ***Asthma attacks***

- ◆ 54.9% of the respondents with current asthma had an asthma attack in the previous 12 months.
- ◆ 62.3% of those who reported asthma attacks were female, 40.7% male.

#### ***Emergency room or urgent care center visits***

- ◆ 17.9% of respondents with current asthma went to the emergency room or urgent care center because of their asthma.



- ◆ The highest percentage of emergency room or urgent care center use for asthma was seen in unmarried respondents (23.4% vs. 13.3% for married) and those whose highest educational level was a high school diploma or GED (25.4%).
- ◆ 19.2% of females and 15.6% of males with current asthma went to the emergency room or urgent care center because of their asthma.
- ◆ 19.9% of respondents with annual incomes less than \$15,000 who currently have asthma went to the emergency room or urgent care center because of their asthma.

### ***Unscheduled visit to health care professional***

- ◆ Overall, 29.5% of respondents reporting current asthma were seen by a health care professional in an unscheduled visit for urgent treatment of their asthma.
- ◆ 34.2% of females reporting current asthma were seen in an unscheduled visit for urgent treatment of their asthma, compared to 20.5% of males.
- ◆ 25.3% of respondents reporting current asthma who earned less than \$15,000 a year and 33.9% of respondents who earned between \$15,000 – \$24,999 a year were seen in an unscheduled visit for urgent treatment of their asthma.
- ◆ 31.6% of married respondents reporting current asthma were seen for urgent treatment of their asthma, compared to 27.1% of unmarried respondents, a reversal of the trend seen in emergency room data.

### ***Severity in Children***

Severity of asthma in a cohort of 23,161 children ages 0 to 17 who were continuously enrolled in Medicaid for at least 11 of 12 months during Fiscal Year 2003. Cases selected for inclusion used the OMPP case definition of asthma and included only those with paid claims.

- 18% had an emergency room visit with any diagnosis of asthma
- 6% were hospitalized with any diagnosis of asthma
- 10% had an emergency room visit with a principal diagnosis of asthma
- 4% were hospitalized with a principal diagnosis of asthma

### ***Severity in Adults***

Severity of asthma in a cohort of 20,030 adults ages 18 to 64 who were continuously enrolled in Medicaid for at least 11 of 12 months during Fiscal Year 2003. Cases selected for inclusion used the OMPP case definition of asthma and included only those with paid claims.

- 18% had an emergency room visit with any diagnosis of asthma
- 10% were hospitalized with any diagnosis of asthma
- 10% had an emergency room visit with a principal diagnosis of asthma
- 5% were hospitalized with a principal diagnosis of asthma

## **Hospitalizations**

The trend of hospital discharges in Indiana indicating a main diagnosis of asthma has been decreasing from 1997 through 2002. The following figures show the hospital discharge data for 2002. The prevalence of asthma is greater in young boys. The hospitalization rate is highest in males under the age of five. During puberty, however, the prevalence and hospitalization rates reverse. From that age, females have the highest prevalence and hospitalization rates for asthma.

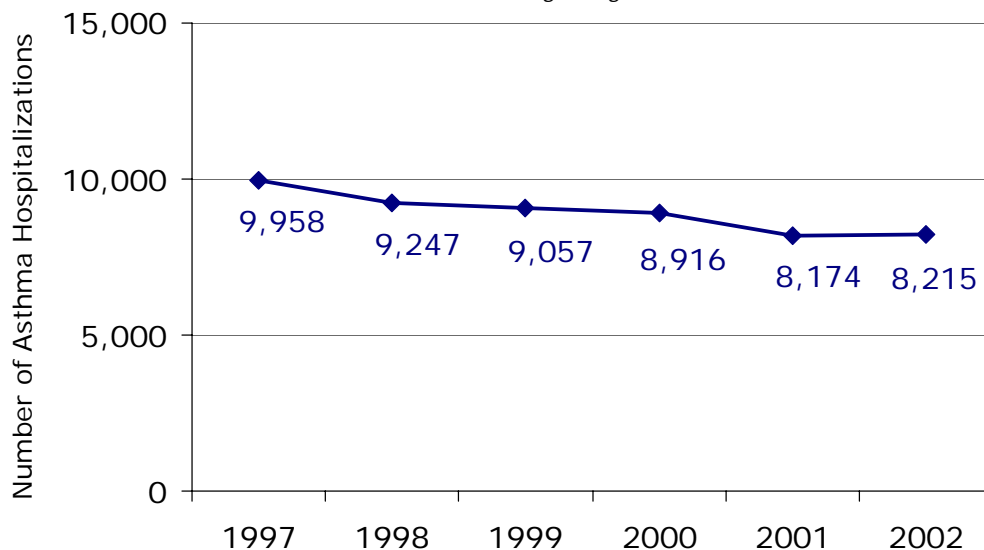
It is important to note that the number of hospitalizations is not the same as the number of people hospitalized for asthma, since some people may have been hospitalized more than once during the year. Counts and rates, especially those based on a small number of hospitalizations, should be interpreted with caution.

The rate of hospitalizations for asthma was highest among black males under the age of five. There were not enough hospitalizations in the Hispanic community to calculate stable hospitalization rates. The data show disparities in hospitalization rates for asthma between the white and black populations.

The largest number of hospitalizations was among females between the ages of 40 and 59 and children, especially boys, under the age of five. This pattern was present in all racial groups. The number of hospitalizations is important when looking at cost and number of hospital beds needed for care.

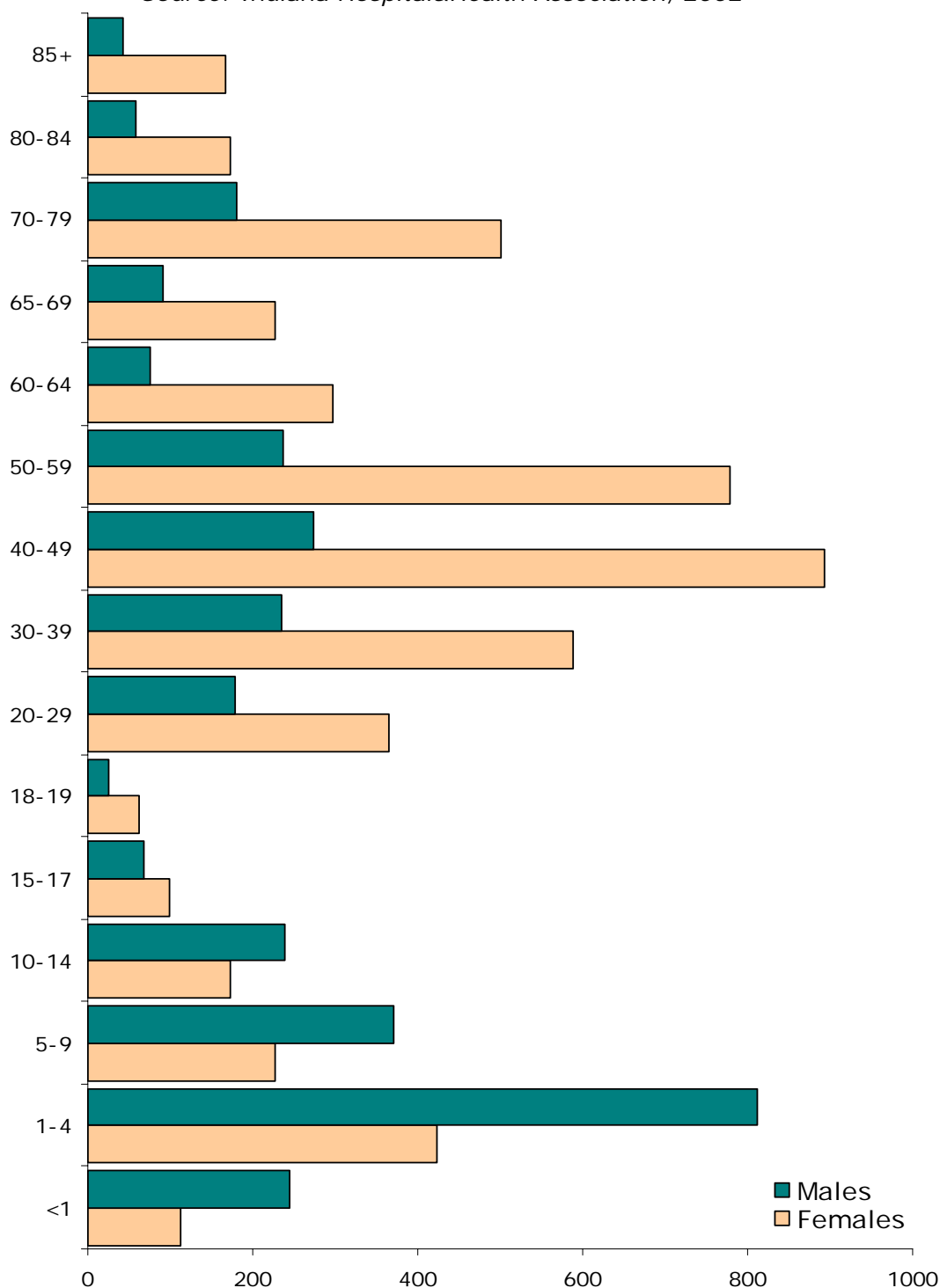
**Figure 18 Indiana Hospitalizations\* for Asthma 1997 - 2002**

*Source: Indiana Hospital & Health Association*  
*\*Asthma was listed as the discharge diagnosis*



**Figure 19 Number of Asthma Hospitalizations - All Races  
by age and sex:**

*Source: Indiana Hospital&Health Association, 2002*

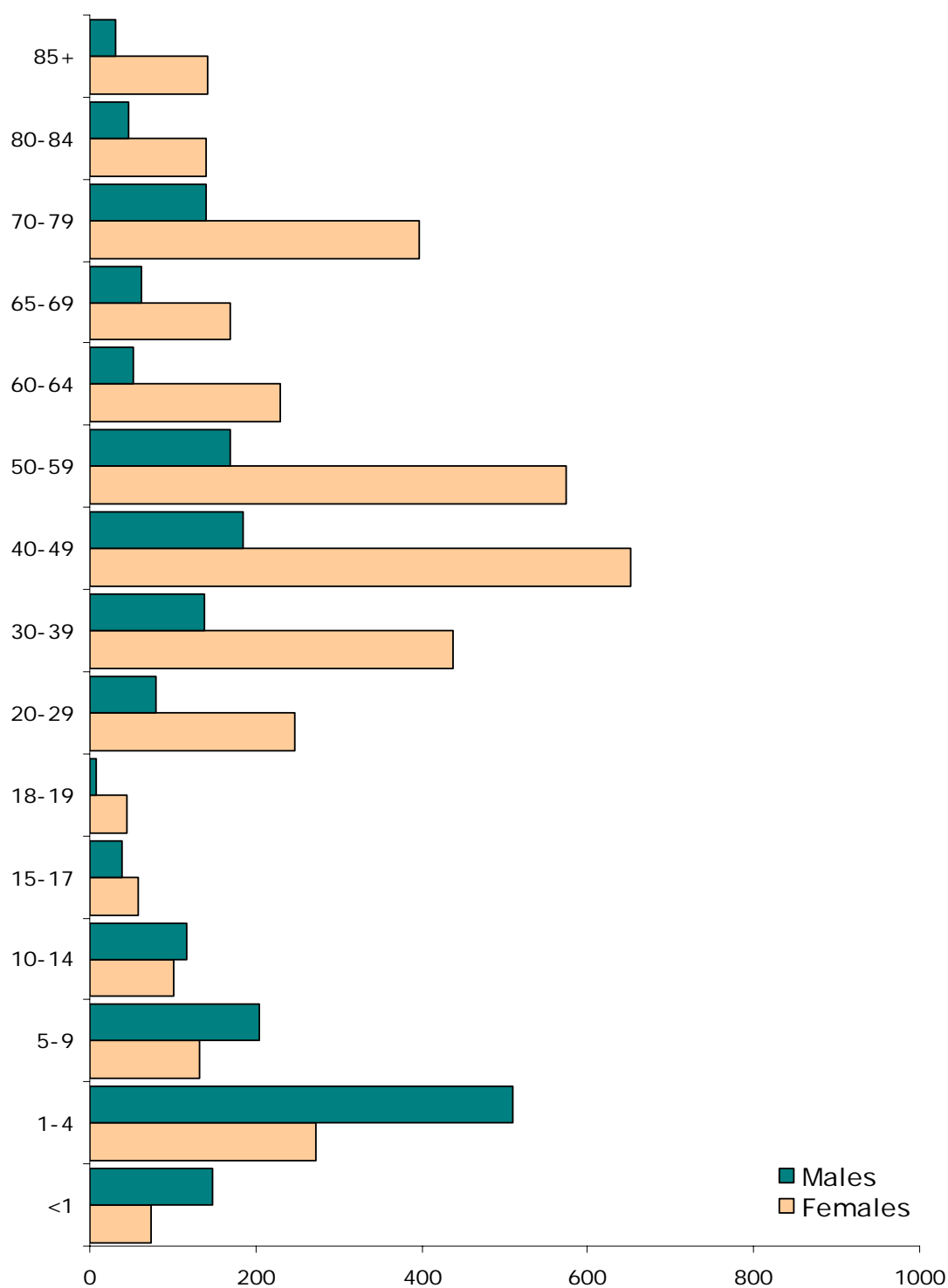


*Note: These data show the number of inpatient hospitalizations with asthma as the discharge diagnosis. This is not the same as the number of persons hospitalized for asthma, since a person could have been hospitalized more than once during 2002.*



**Figure 20 Number of Asthma Hospitalizations - White  
by age and sex:**

*Source: Indiana Hospital&Health Association 2002*

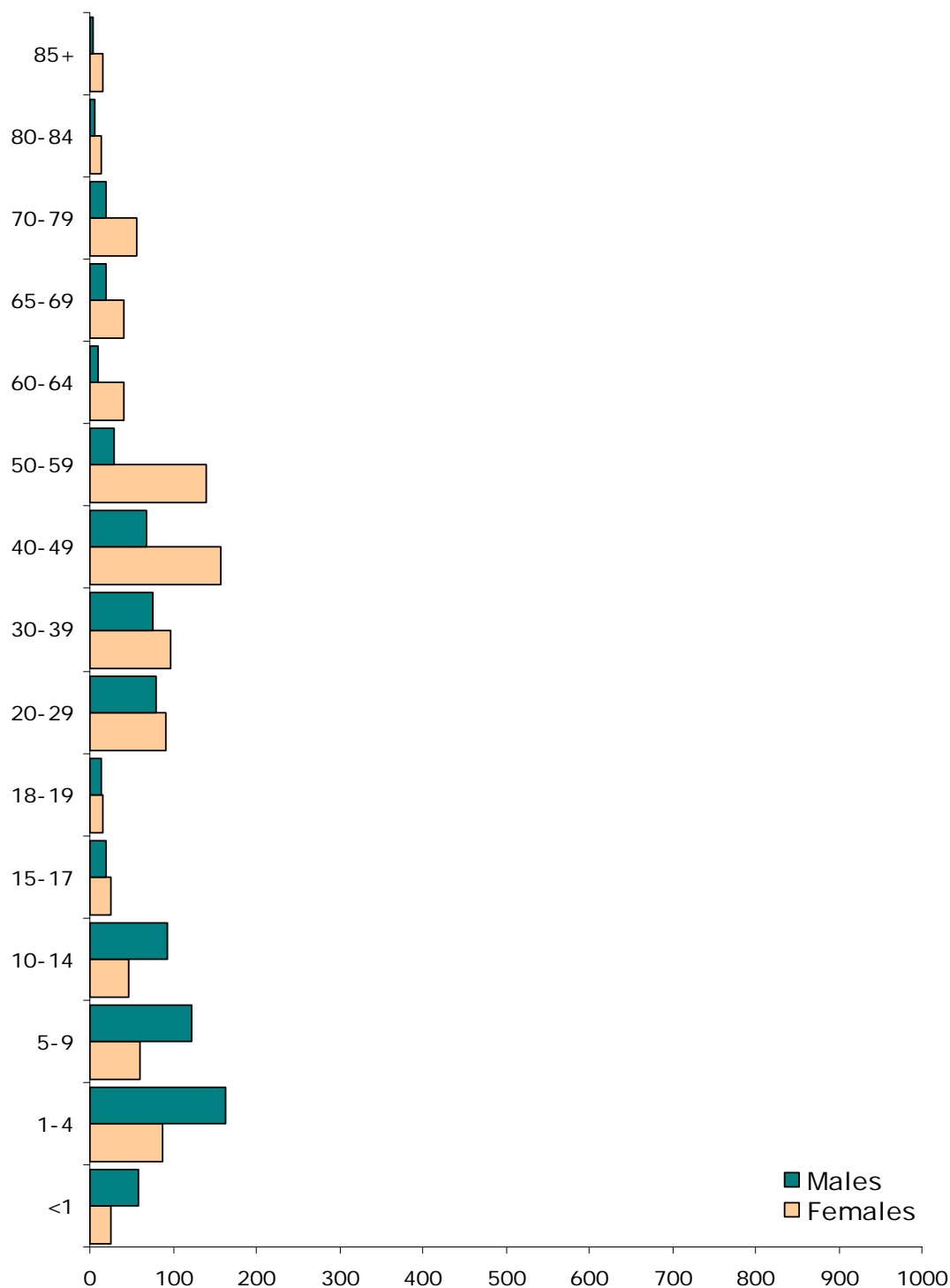


*Note: These data show the number of inpatient hospitalizations with asthma as the discharge diagnosis. This is not the same as the number of persons hospitalized for asthma, since a person could have been hospitalized more than once during 2002.*



**Figure 21 Number of Asthma Hospitalizations - Black  
by age and sex:**

*Source: Indiana Hospital&Health Association 2002*

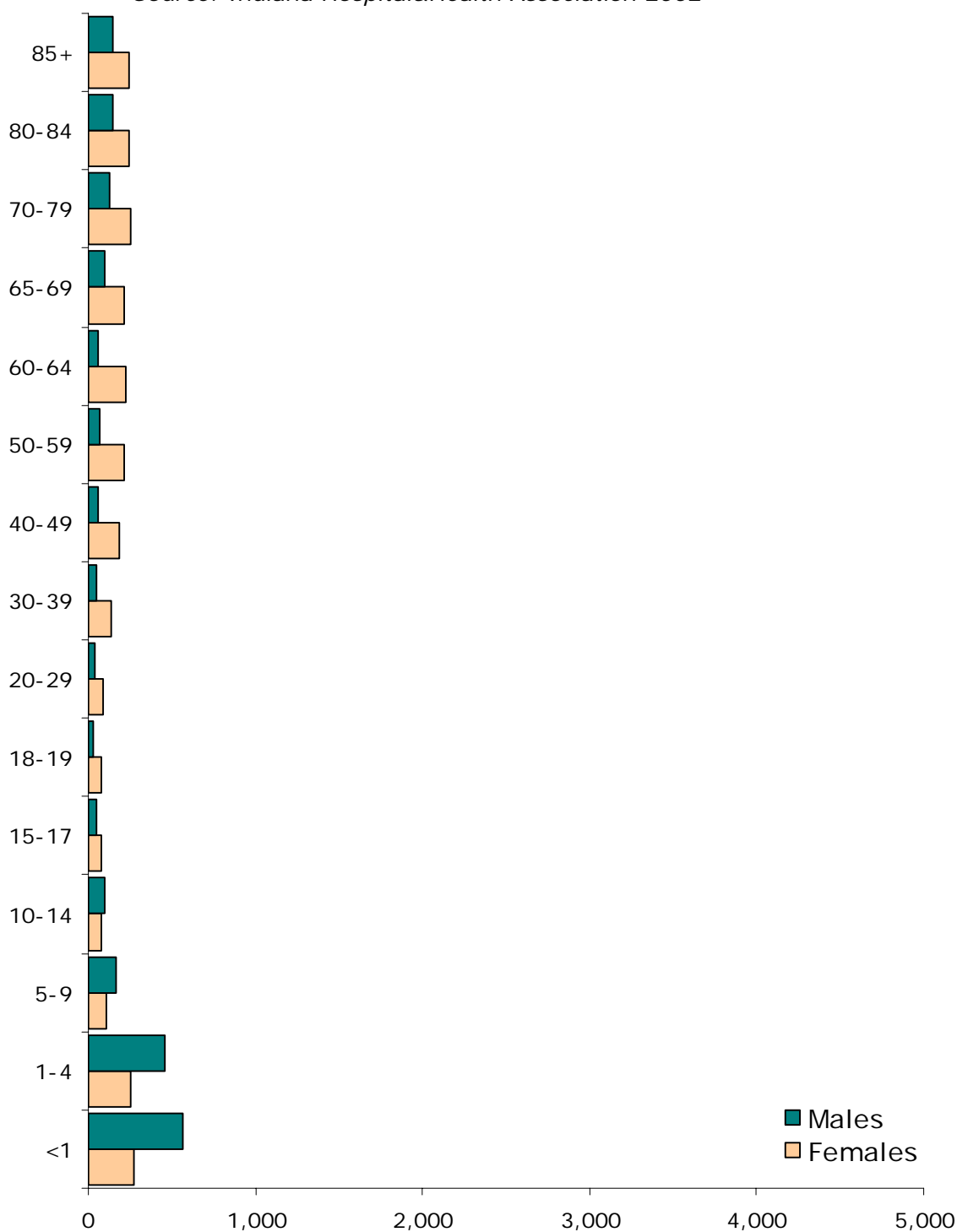


*Note: These data show the number of inpatient hospitalizations with asthma as the discharge diagnosis. This is not the same as the number of persons hospitalized for asthma, since a person could have been hospitalized more than once during 2002.*

**Figure 22 Asthma Hospitalization Rate - All Races  
by age and sex:**

*Age-specific hospital discharge rates per 100,000 population*

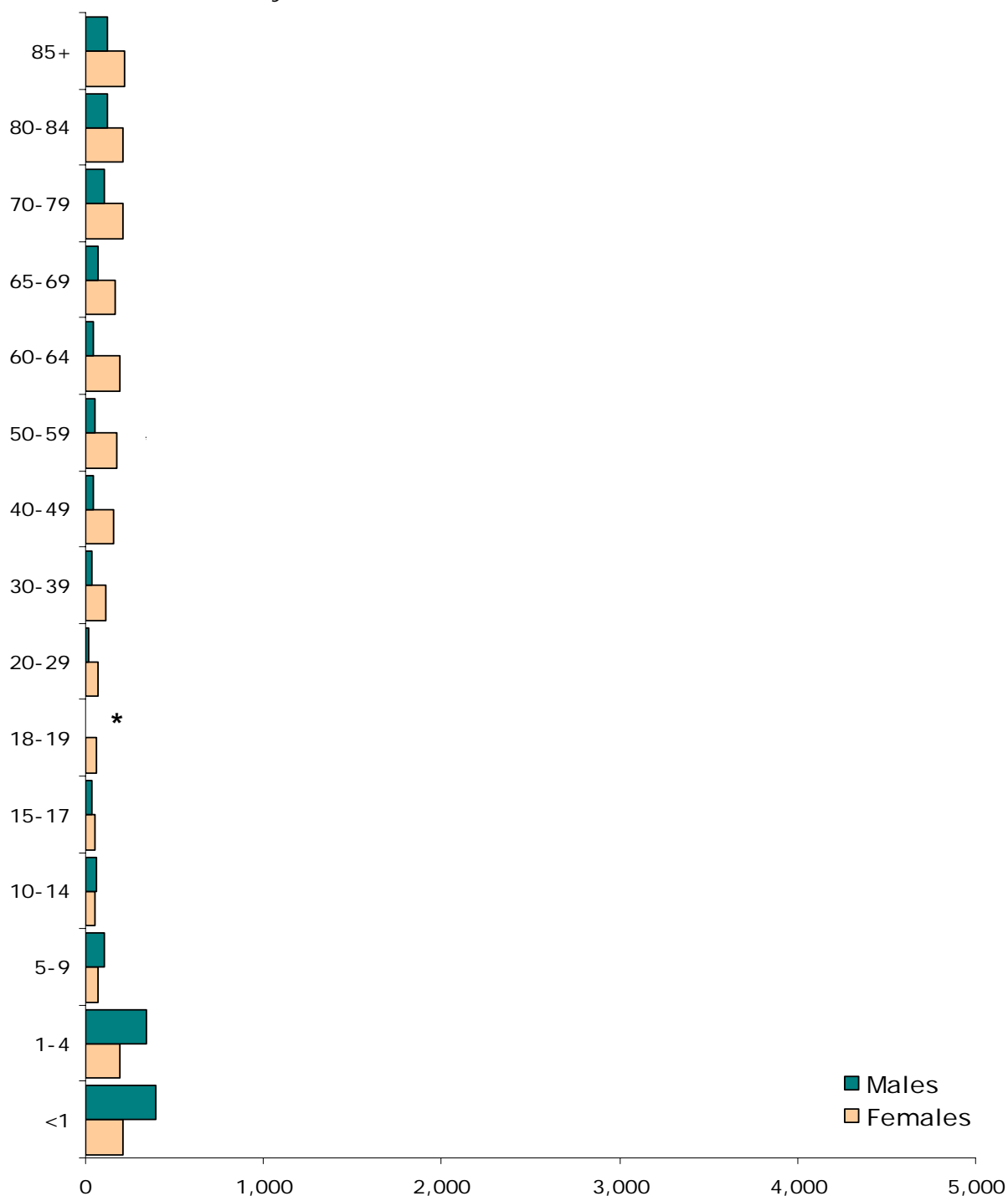
*Source: Indiana Hospital & Health Association 2002*



*Note: Rates are based on the number of inpatient hospitalizations with asthma as the discharge diagnosis. This is not the same as the number of persons hospitalized for asthma, since a person could have been hospitalized more than once during 2002.*

**Figure 23 Asthma Hospitalization Rate - White  
by age and sex:**

*Age-specific hospital discharge rates per 100,000*  
*Source: Indiana Hospital&Health Association 2002*  
*\* Rates may be unreliable due to small numbers*



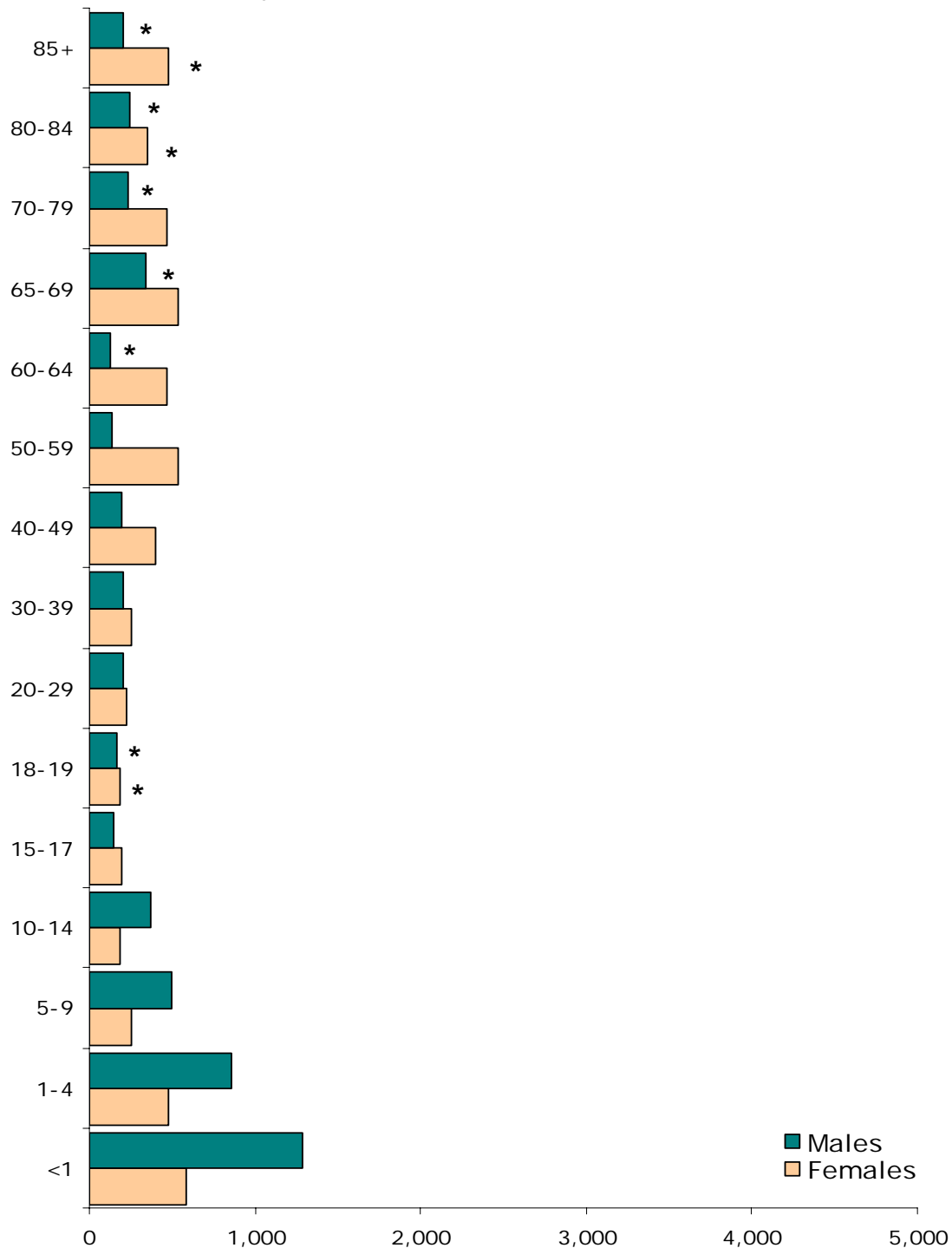
*Note: Rates are based on the number of inpatient hospitalizations with asthma as the discharge diagnosis. This is not the same as the number of persons hospitalized for asthma, since a person could have been hospitalized more than once during 2002.*

## Figure 24 Asthma Hospitalization Rate - Black by age and sex:

Age-specific discharge rates per 100,000

Source: Indiana Hospital & Health Association 2002

\* Rates may be unreliable due to small numbers



Note: Rates are based on the number of inpatient hospitalizations with asthma as the discharge diagnosis. This is not the same as the number of persons hospitalized for asthma, since a person could have been hospitalized more than once during 2002.



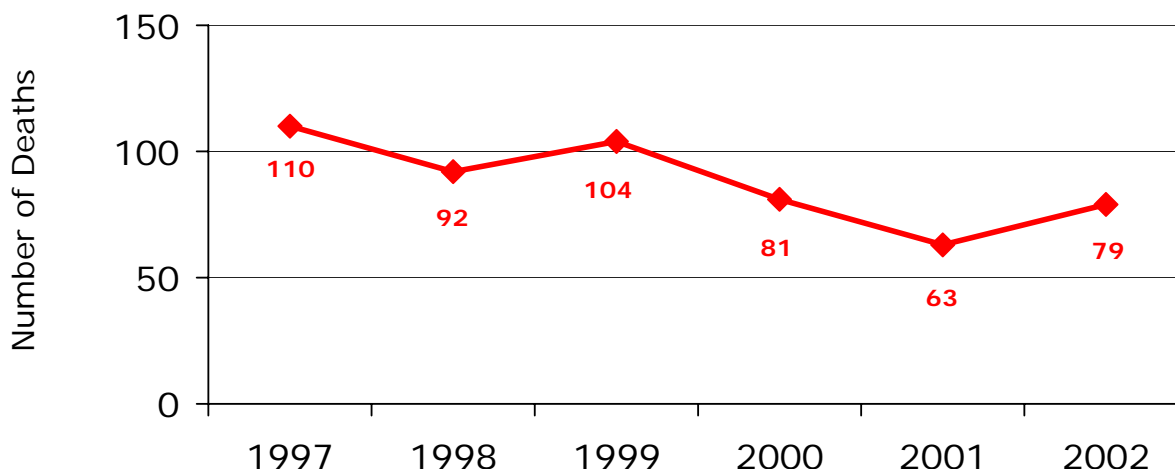
## Mortality

Mortality data are derived from deaths of Indiana residents, and are based on the cause of death listed on the Indiana death certificate. Information is provided to the state on each cause of death under the authority of Indiana State Code 16-1-15-5. In 1997 and 1998, the International Statistical Classification of Diseases and Related Health Problems Ninth Revision (ICD-9) codes were used to specify the cause of death. Beginning in 1999, ICD-10 codes were used. For the Indiana mortality data that follow, the 1997 and 1998 death rates have been comparability adjusted (comparability ratio of .8938) for the change from ICD-9 to ICD-10 coding. Death rates have been age-adjusted to the year 2000 population.

From 1997 through 2001, the number and rate of asthma deaths in Indiana have been decreasing. In 2001, there were 63 deaths attributed to asthma. 76.2% of those deaths were in whites, 22.2% were in blacks. The largest number of deaths (17 or 30%) occurred in the 85 and older age group.

**Figure 25 Indiana Asthma Mortality 1997 – 2002**  
**Number of Deaths**

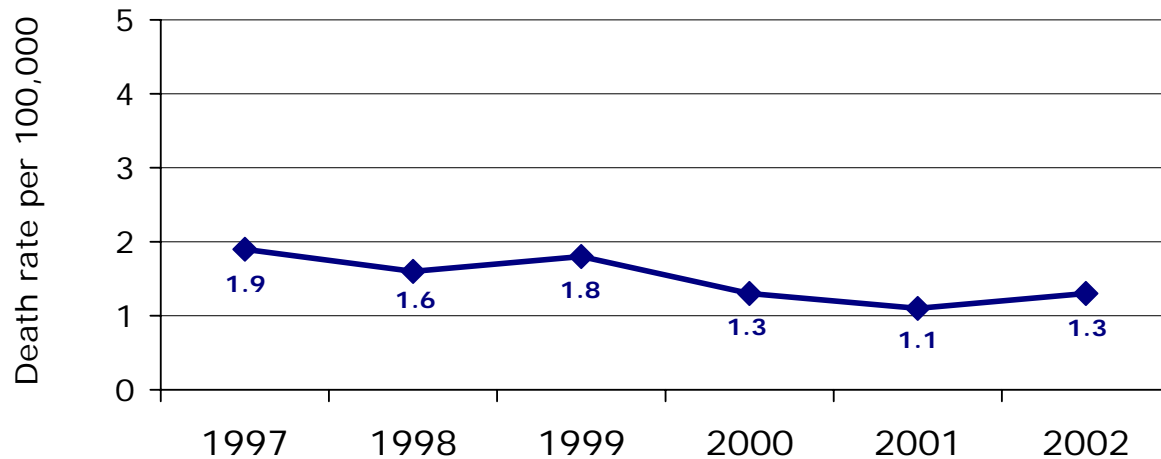
*Source: Indiana State Department of Health*



*Note: In 1997 and 1998, ICD-9 coding was used to determine the number of asthma deaths. Beginning in 1999, ICD-10 coding was used to determine the number of asthma deaths. Deaths across this change cannot be compared without adjusting for the change in coding. Therefore, the number of deaths in 1997 and 1998 have been comparability adjusted (comparability ratio of .8938) for the change to ICD-10 coding.*

**Figure 26 Indiana Asthma Mortality 1997 – 2002**  
**Rate per 100,000**

*Source: Indiana State Department of Health*



Note: death rates have been age adjusted to the year 2000 population. The 1997 and 1998 death rates have been comparability adjusted (comparability ratio of .8938) for the change to ICD-10 coding in 1999.

## Cost of Asthma

### Financial Costs

The Asthma and Allergy Foundation of America has estimated the costs of asthma for the United States, as well as for individual states. Their estimates include both direct and indirect costs related to asthma. Direct costs are comprised of hospital care, both inpatient and outpatient, emergency care, physician care, and medications. Indirect costs relate to time lost from either school or work (defined to include both outside work and housekeeping.) In 1998 direct medical expenditures for asthma in the State of Indiana were estimated to be \$161,599,000; indirect costs were estimated to be \$116,631,000, for a total of \$278,230,000.

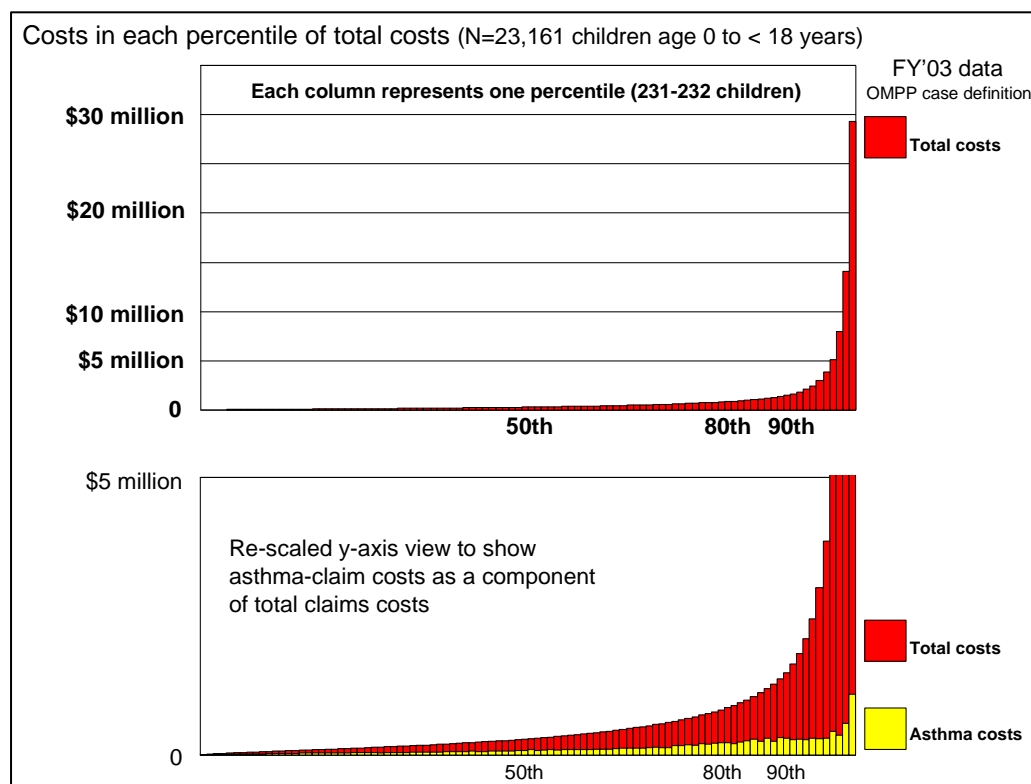
Medicaid administrative claims data for FY 2003 provided some useful information about the financial costs of asthma in the Medicaid population. As indicated in Figures 27 and 28, the costs directly attributable to asthma are a relatively small percentage of total medical costs, and those in the highest percentiles for total medical costs are those in the highest cost percentiles for asthma medical costs. Among children with claims for asthma services or three or more asthma medications, the average cost of asthma care was \$557 per child in FY2003. For adults with asthma, the average annual cost was \$880 per person. However, the cost burden was not evenly shared. A small fraction of persons with asthma incurred a large fraction of the costs.

It is important to note that direct medical costs for asthma in the Indiana Medicaid population were, for the most part, low and relatively stable through about the 50th percentile in both adults and children. From the 50th percentile on, costs increased dramatically. In the Medicaid cohort of 23,161 children under the age of 18, the children with the most costly asthma had direct asthma medical costs that reached \$125,295 in a year. In the cohort of 20,030 adults, ages 18 – 64, the highest direct asthma medical costs reached \$82,005.

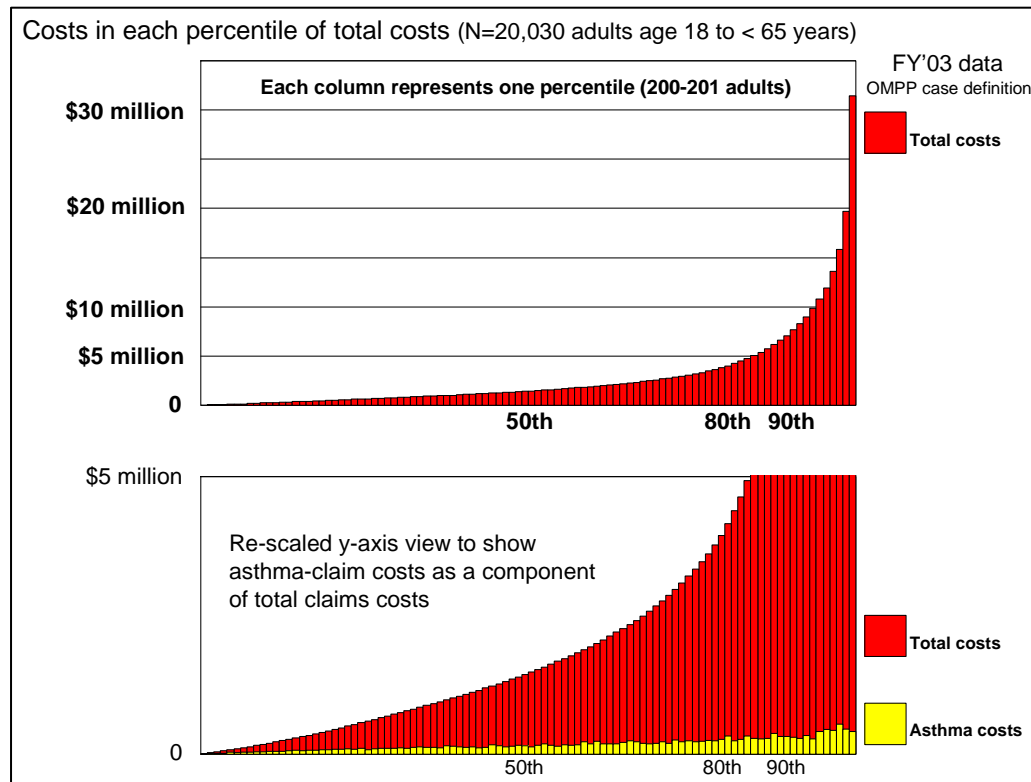
These findings are comparable to those of Cisternas, et al. (2003). This study found that the direct medical costs of asthma increased dramatically with self-reported asthma severity. They found the average direct medical costs (adjusted to 1998 dollars) were \$1,681 for those with mild asthma, \$2473 for those with moderate asthma and \$6,354 for those with severe asthma. Overall direct medical costs of asthma were \$2,697, with asthma medicines accounting for slightly more than half the direct medical costs at \$1,605.

Cisternas, M. G., Blanc, P. D., Yen, I. H., Katz, P. P., Earnest, G., Eisner, M. D., Shiboski, S., & Yelin, E. H. (2003). A comprehensive study of the direct and indirect costs of adult asthma [Electronic version]. *Journal of Allergy and Clinical Immunology*, 111, 1212-1218.

**Figure 27 Direct medical costs of asthma in a Medicaid cohort of children age 0—17:  
Indiana Medicaid FY 2003**  
Source: OMPP



**Figure 28 Direct medical costs of asthma in a Medicaid cohort of Adults age 18—64:**  
**Indiana Medicaid 2003**  
*Source: OMPP*



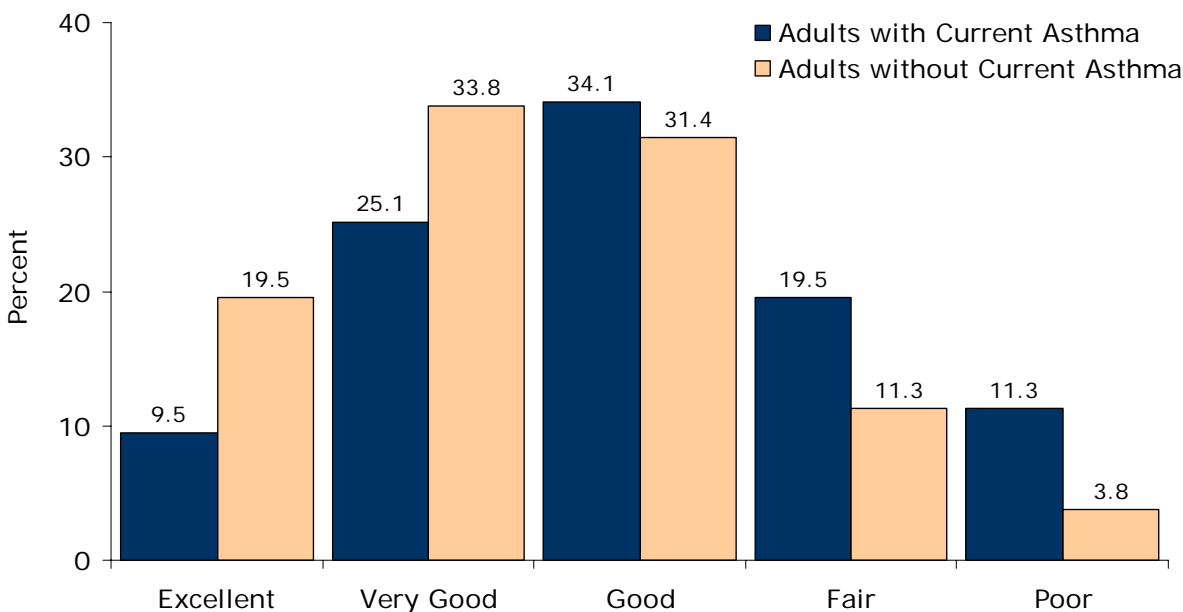
## Quality of Life

The following charts derived from BRFSS survey data depict some of the impact of asthma on quality of life by comparing the responses of those who reported they had asthma with those who did not have asthma. Although causality cannot be proven by association, it appears that Indiana citizens with asthma are more likely to report that they felt sad, blue or depressed, that they were worried, tense or anxious, and that they had not had enough rest or sleep.

- ◆ Respondents with asthma were less likely to report feeling very healthy and full of energy.
- ◆ Among respondents who reported their perceived health status to be poor, 19.2% had asthma.
- ◆ Of respondents who reported their perceived health status to be excellent, only 3.8% had asthma.

**Figure 29 Reported health status, distribution in respondents with/without current asthma: Indiana 2002**

Source: Indiana BRFSS 2002

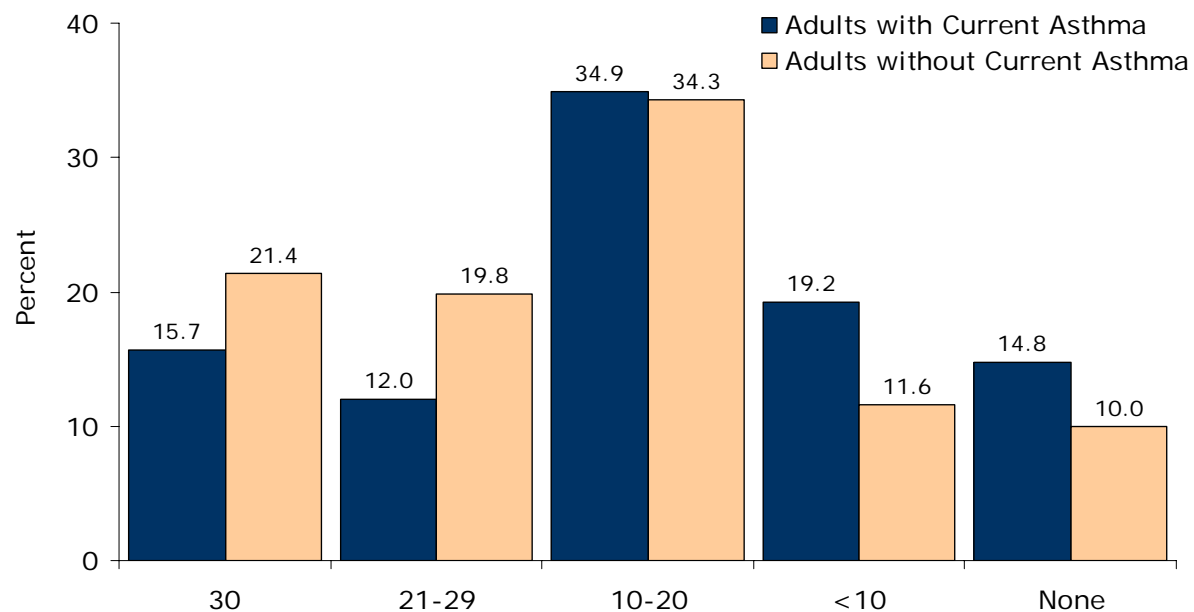


Percentage breakdown of categories within survey populations of respondents with/without current asthma. Percentages may not add up to 100% because respondents who refused to answer, or answered "unknown" to the category questions are not shown.

Survey population of adults with current asthma are respondents who answered "yes" to **both** asthma core questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"

Survey population of adults without current asthma are respondents who answered "no" to **either** of the above questions.

**Figure 30 Number of days felt healthy in the last month, distribution in respondents with/without current asthma:**  
**Indiana 2002**    *Source: Indiana BRFSS 2002*

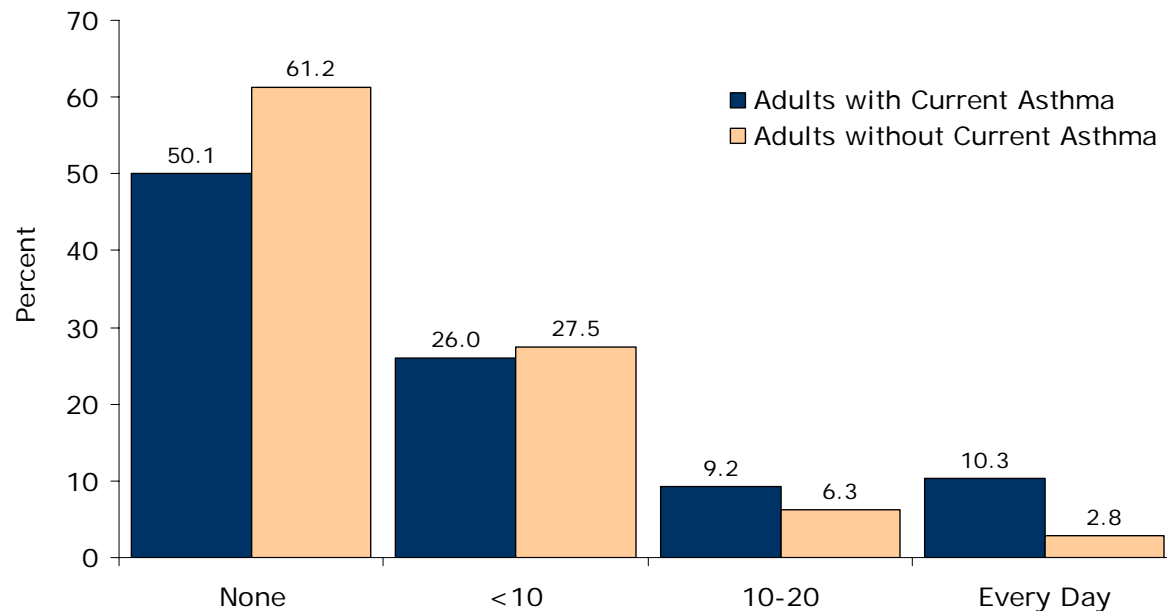


*Percentage breakdown of categories within survey populations of respondents with/without current asthma. Percentages may not add up to 100% because respondents who refused to answer, or answered "unknown" to the category questions are not shown.*

*Survey population of adults with current asthma are respondents who answered "yes" to **both** asthma core questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"*

*Survey population of adults without current asthma are respondents who answered "no" to **either** of the above questions.*

**Figure 31 Number of days felt sad, blue or depressed in last month, percent distribution in respondents with/without current asthma: Indiana 2002** *Source: BRFSS 2002*

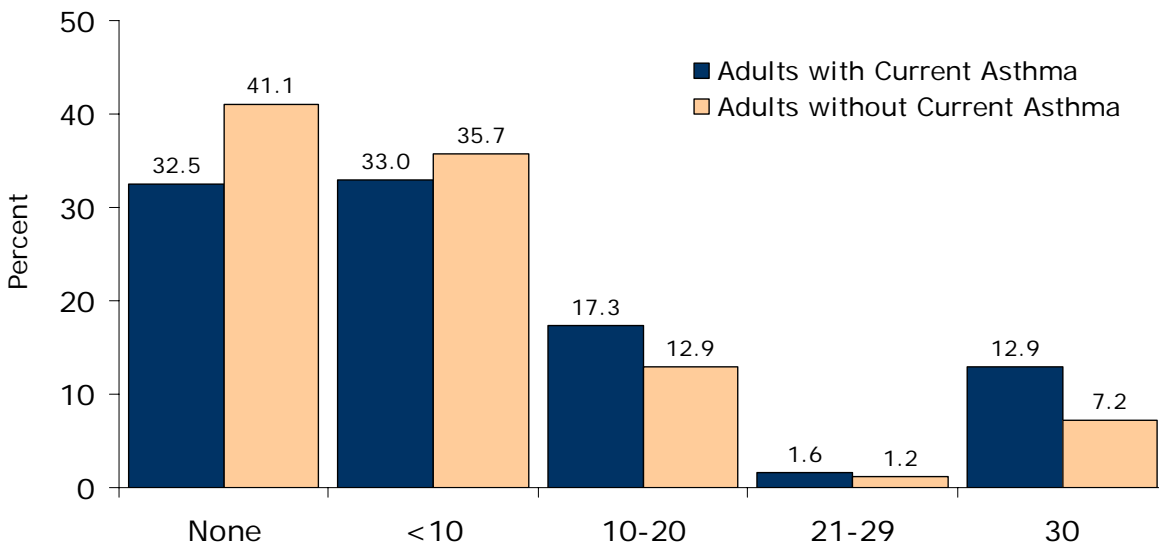


*Percentage breakdown of categories within survey populations of respondents with/without current asthma. Percentages may not add up to 100% because respondents who refused to answer, or answered "unknown" to the category questions are not shown.*

*Survey population of adults with current asthma are respondents who answered "yes" to **both** asthma core questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"*

*Survey population of adults without current asthma are respondents who answered "no" to **either** of the above questions.*

**Figure 32 Number of days felt stressed during the last month, percent distribution in respondents with/without current asthma: Indiana 2002** *Source: BRFSS 2002*



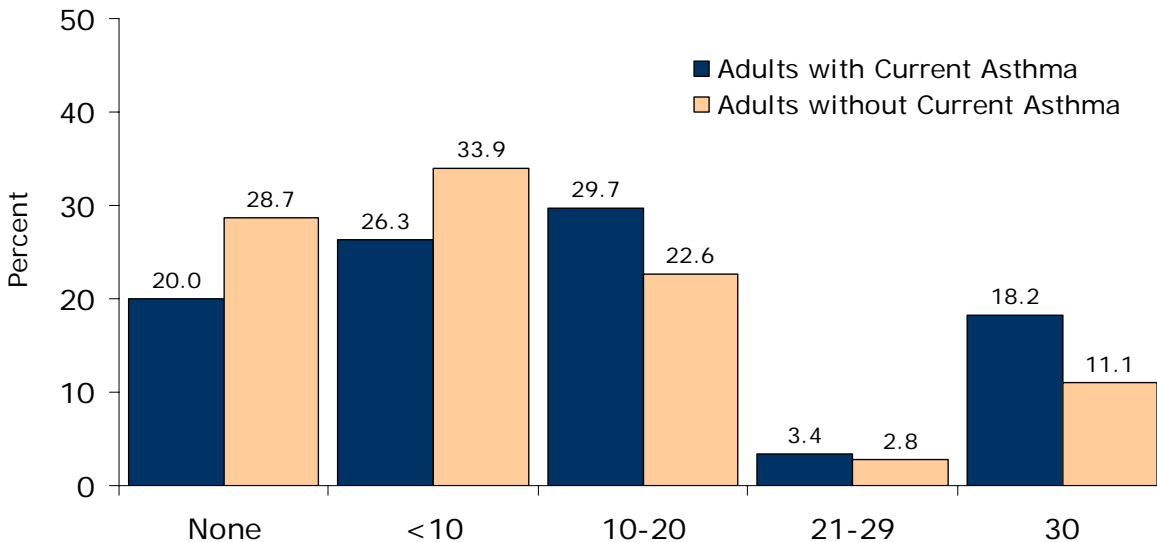
*Percentage breakdown of categories within survey populations of respondents with/without current asthma. Percentages may not add up to 100% because respondents who refused to answer, or answered "unknown" to the category questions are not shown.*

*Survey population of adults with current asthma are respondents who answered "yes" to **both** asthma core questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"*

*Survey population of adults without current asthma are respondents who answered "no" to **either** of the above questions.*



**Figure 33 Number of days didn't get enough rest during the last month, percent distribution in respondents with/without current asthma: Indiana 2002** *Source: BRFSS 2002*



*Percentage breakdown of categories within survey populations of respondents with/without current asthma. Percentages may not add up to 100% because respondents who refused to answer, or answered "unknown" to the category questions are not shown.*

*Survey population of adults with current asthma are respondents who answered "yes" to **both** asthma core questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"*

*Survey population of adults without current asthma are respondents who answered "no" to **either** of the above questions.*

## Quality of Asthma Care

It is recommended in the asthma care consensus guidelines of the National Heart Lung and Blood Institute (NHLBI) that patients with asthma have at least two scheduled visits annually to care for their asthma.

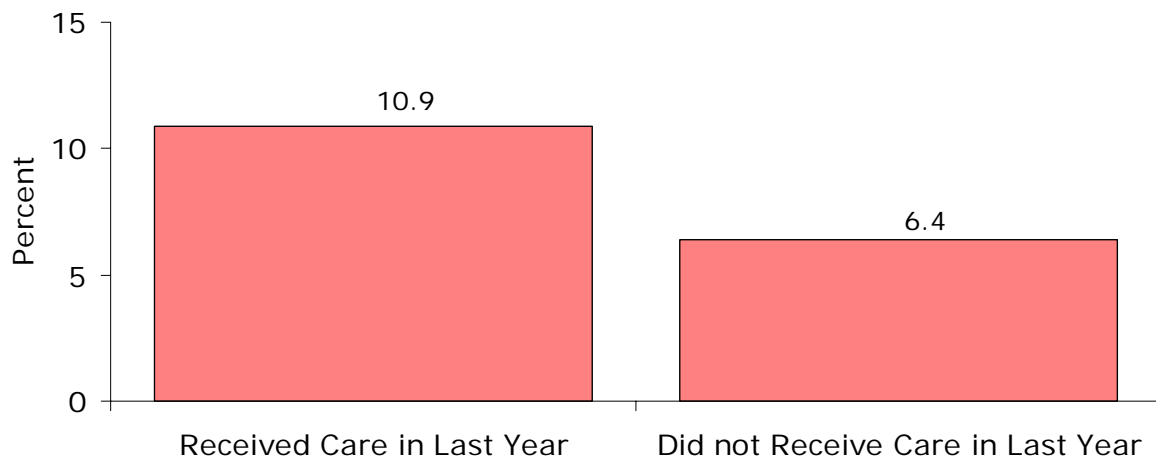
The NHLBI guidelines also recommend that people with "persistent" asthma be managed with a controller medication (e.g., inhaled steroids). The NCQA case definition for persistent asthma, based on claims data, makes it possible to examine the rates at which this recommendation is followed among people in Indiana with persistent asthma.

Finally it is recommended that all people with asthma receive an annual influenza vaccine.

- ◆ Only 52.5% of BRFSS respondents with current asthma indicated they had at least one routine checkup for their asthma in the past 12 months.
- ◆ Respondents with the highest percentage of at least one routine checkup for their current asthma were those with annual household incomes less than \$15,000 (65.8%) and those with less than a high school education (60.9%).
- ◆ Of respondents with current asthma, 59.6% of women vs. 38.7% of men had at least one routine checkup for their asthma.
- ◆ The age group with the highest rate of routine visits for their current asthma was the 35-44 age group (61.3%). The age group with the lowest percentage of routine visits for their current asthma was the 45-54 age group (45.3%).

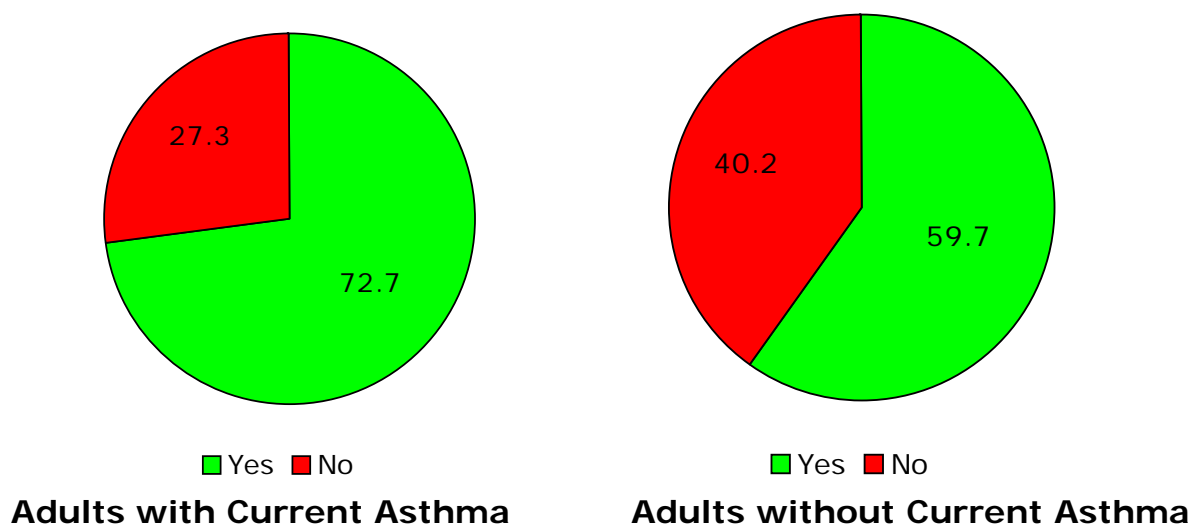
**Figure 34 Current asthma prevalence by medical care in last year:  
Indiana 2002**

*Source: Indiana BRFSS 2002*



*Percentage of respondents within each category who answered "yes" to the questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"*

**Figure 35 Medical care in last year, percent distribution in respondents with/without current asthma:**  
**Indiana 2002** Source: Indiana BRFSS 2002

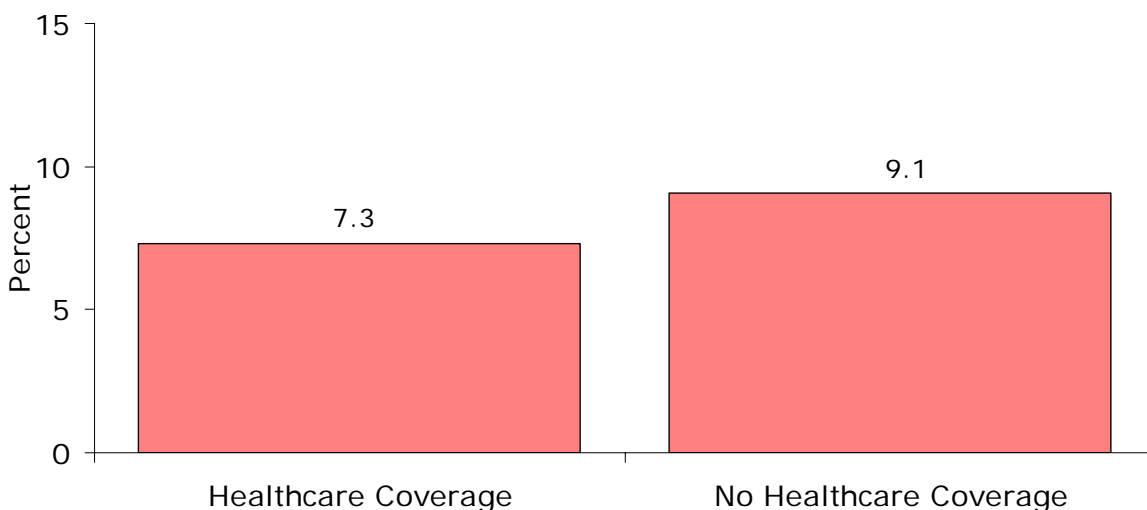


Percentage breakdown of categories within survey populations of respondents with/without current asthma. Percentages may not add up to 100% because respondents who refused to answer, or answered "unknown" to the category questions are not shown.

Survey population of adults with current asthma are respondents who answered "yes" to **both** asthma core questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"

Survey population of adults without current asthma are respondents who answered "no" to **either** of the above questions.

**Figure 36 Current asthma prevalence by healthcare coverage:**  
**Indiana 2002**  
 Source: Indiana BRFSS 2002

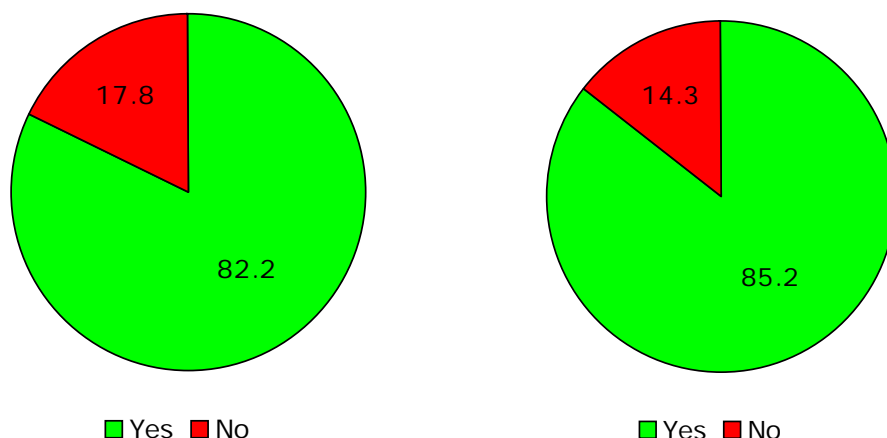


Percentage of respondents within each category who answered "yes" to the questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"



**Figure 37 Healthcare coverage, percent distribution in respondents with/without current asthma: Indiana 2002**

Source: Indiana BRFSS 2002



#### Adults with Current Asthma

#### Adults without Current Asthma

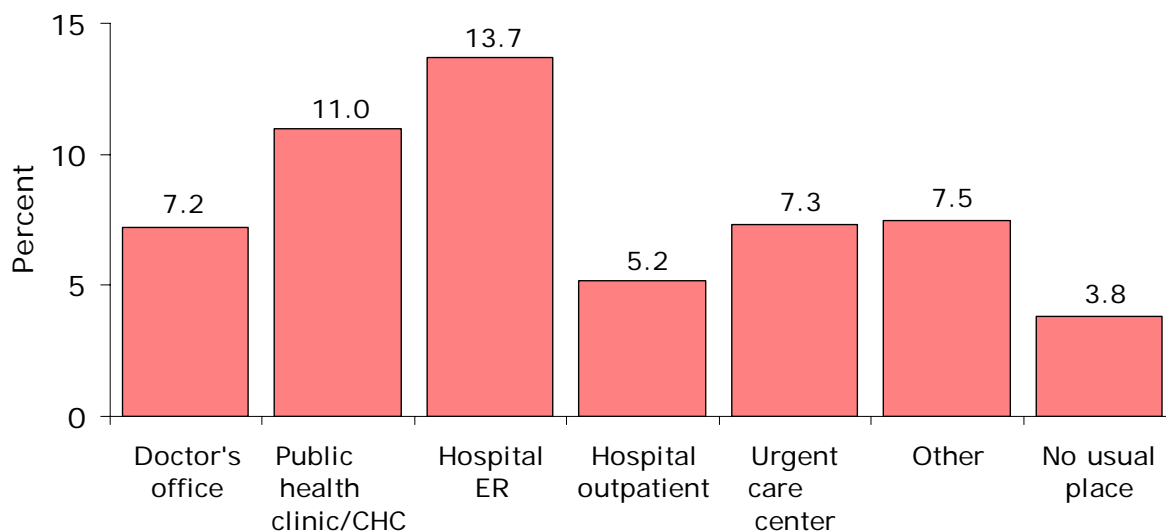
Percentage breakdown of categories within survey populations of respondents with/without current asthma. Percentages may not add up to 100% because respondents who refused to answer, or answered "unknown" to the category questions are not shown.

Survey population of adults with current asthma are respondents who answered "yes" to **both** asthma core questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"

Survey population of adults without current asthma are respondents who answered "no" to **either** of the above questions.

**Figure 38 Current asthma prevalence by place of usual care: Indiana 2002**

Source: Indiana BRFSS 2002

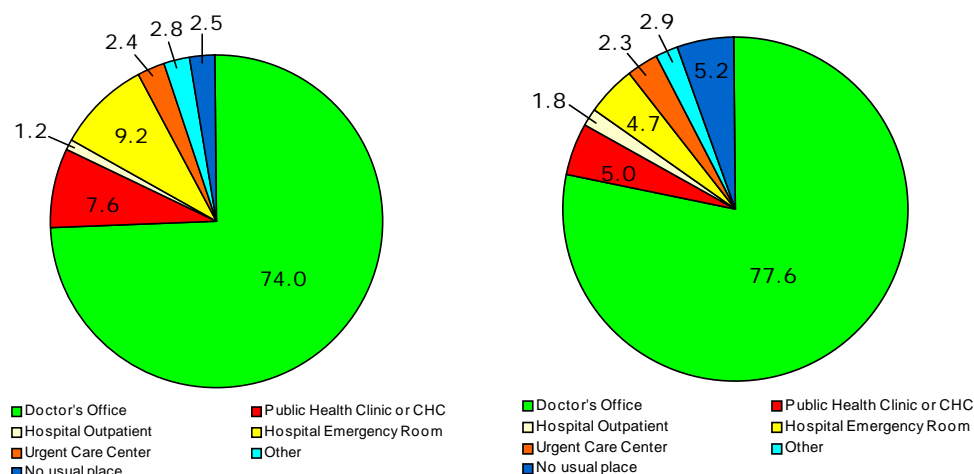


Percentage of respondents within each category who answered "yes" to the questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"



**Figure 39 Place of usual care, percent distribution in respondents with/without current asthma: Indiana 2002**

Source: Indiana BRFSS 2002



#### Adults with Current Asthma

#### Adults without Current Asthma

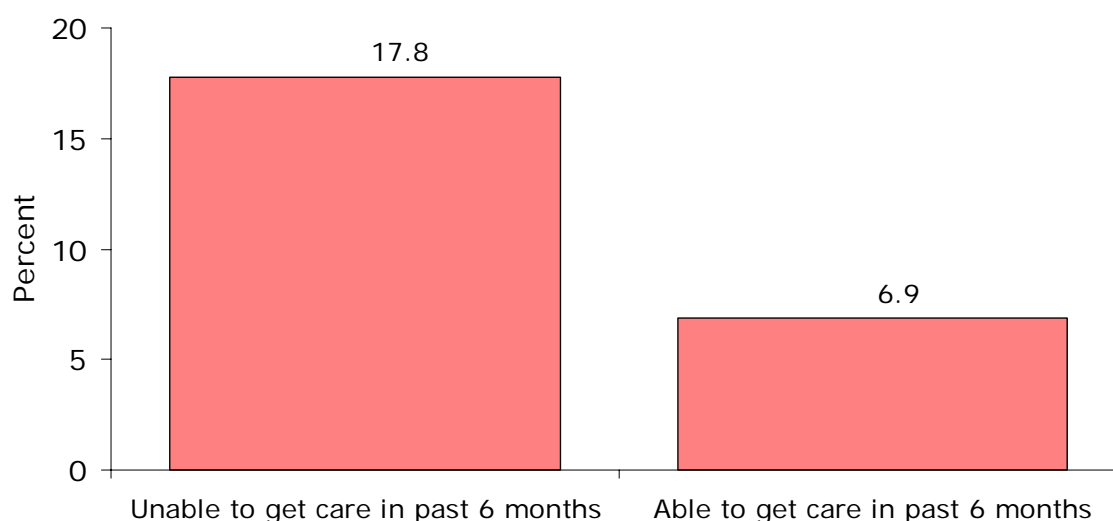
Percentage breakdown of categories within survey populations of respondents with/without current asthma. Percentages may not add up to 100% because respondents who refused to answer, or answered "unknown" to the category questions are not shown.

Survey population of adults with current asthma are respondents who answered "yes" to **both** asthma core questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"

Survey population of adults without current asthma are respondents who answered "no" to **either** of the above questions.

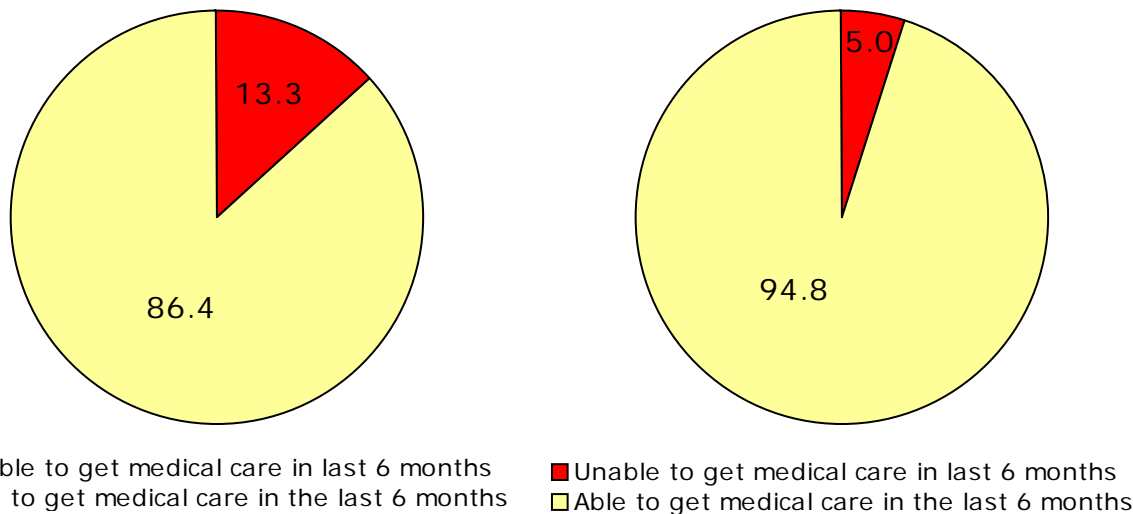
**Figure 40 Current asthma prevalence by ability to obtain medical care in last 6 months: Indiana 2002**

Source: Indiana BRFSS 2002



Percentage of respondents within each category who answered "yes" to the questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"

**Figure 41 Ability to obtain medical care in last 6 months, percent distribution in respondents with/without current asthma: Indiana 2002** *Source: Indiana BRFSS 2002*



#### Adults with Current Asthma

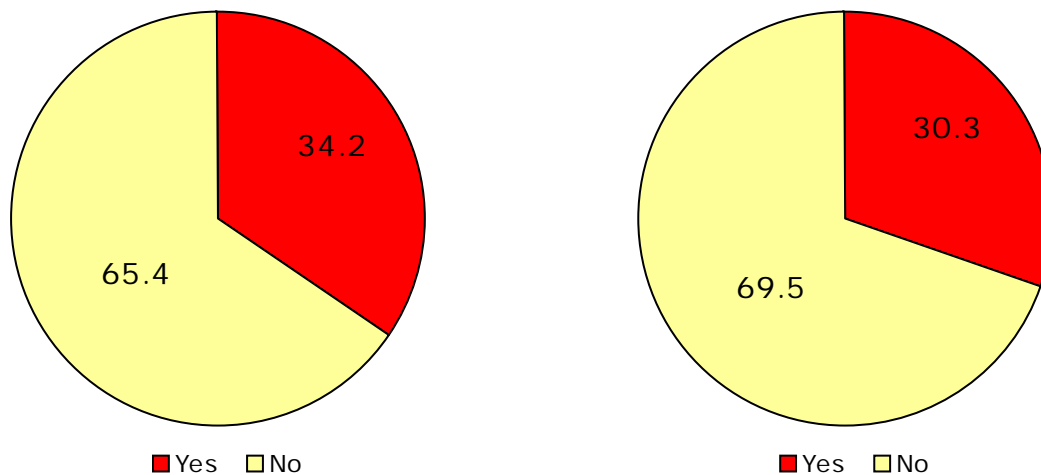
#### Adults without Current Asthma

*Percentage breakdown of categories within survey populations of respondents with/without current asthma. Percentages may not add up to 100% because respondents who refused to answer, or answered "unknown" to the category questions are not shown.*

*Survey population of adults with current asthma are respondents who answered "yes" to **both** asthma core questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"*

*Survey population of adults without current asthma are respondents who answered "no" to **either** of the above questions.*

**Figure 42 Receipt of flu shot in last 12 months, percent distribution in respondents with/without current asthma:**  
**Indiana 2002** *Source: BRFSS 2002*



#### Adults with Current Asthma

#### Adults without Current Asthma

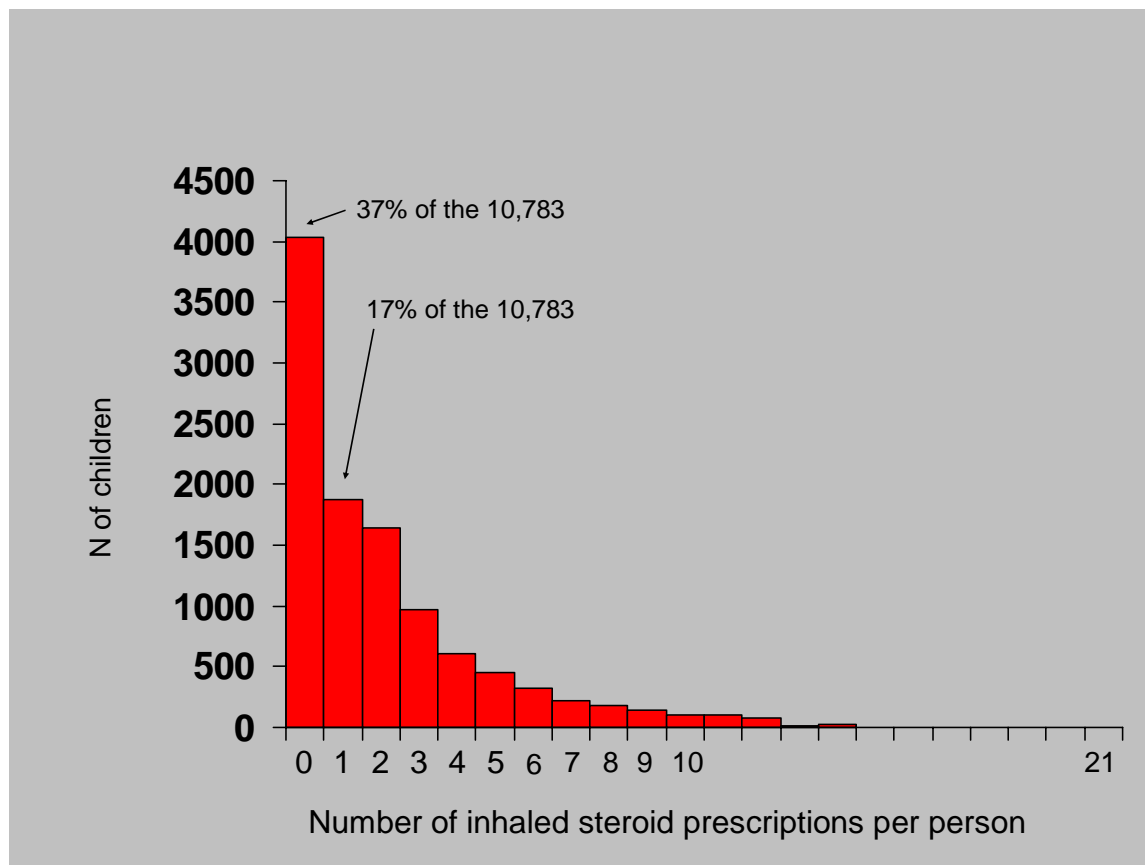
*Percentage breakdown of categories within survey populations of respondents with/without current asthma. Percentages may not add up to 100% because respondents who refused to answer, or answered "unknown" to the category questions are not shown.*

*Survey population of adults with current asthma are respondents who answered "yes" to **both** asthma core questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"*

*Survey population of adults without current asthma are respondents who answered "no" to **either** of the above questions.*

**Figure 43 Rx Claims for Inhaled Steroids for Children under 18  
Indiana Medicaid FY 2003**

Source: OMPP



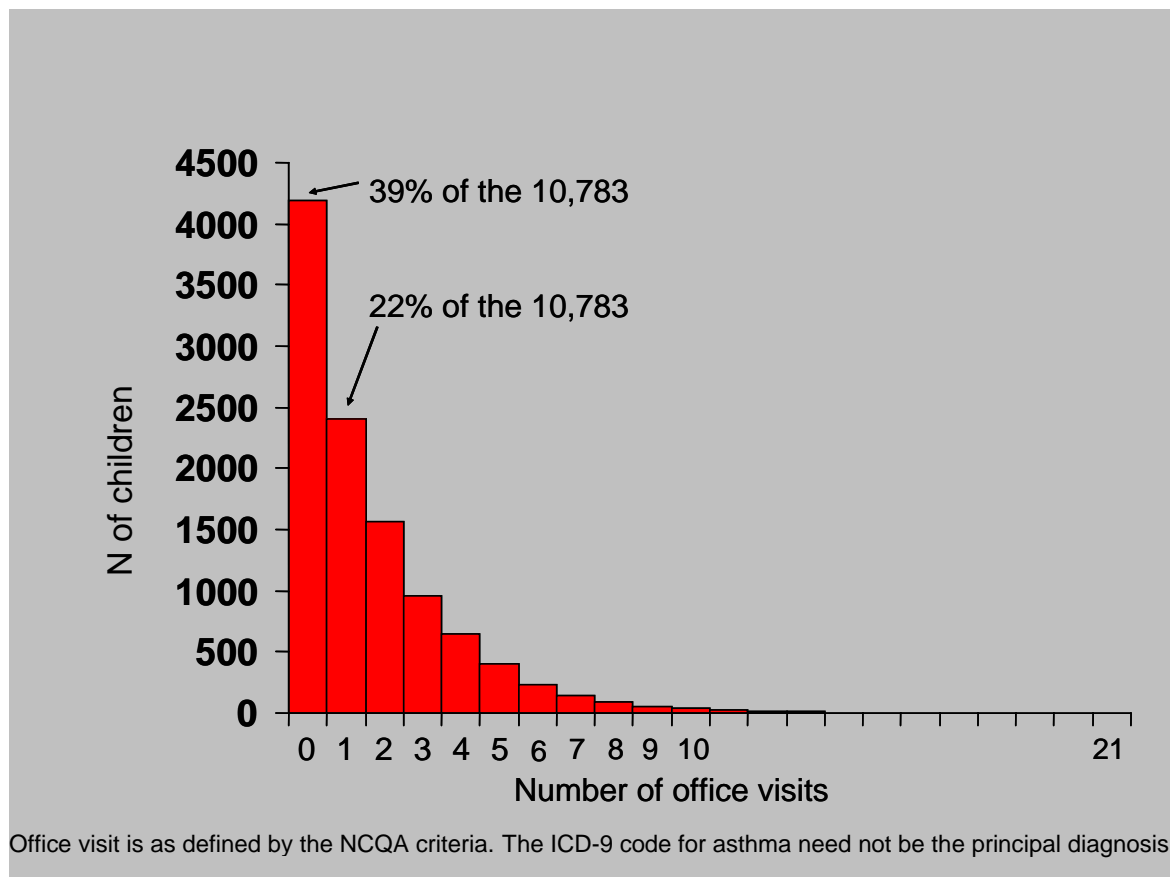
Annual number of prescriptions for inhaled steroids among children with persistent asthma: According to NHLBI guidelines, children and adults with persistent asthma should use controller medicines daily. This schedule would require several prescriptions annually. The majority of children with asthma do not receive this recommended number of prescriptions.

*Note: This figure shows the number of prescription claims for inhaled steroids in the Medicaid cohort of 10,783 children <18 who were identified with persistent asthma using the NCQA case definition and who were also enrolled in Medicaid at least 11 of 12 months during FY 2003.*



**Figure 44 Office Visits for Asthma in Children under 18  
Indiana Medicaid FY 2003**

Source: OMPP

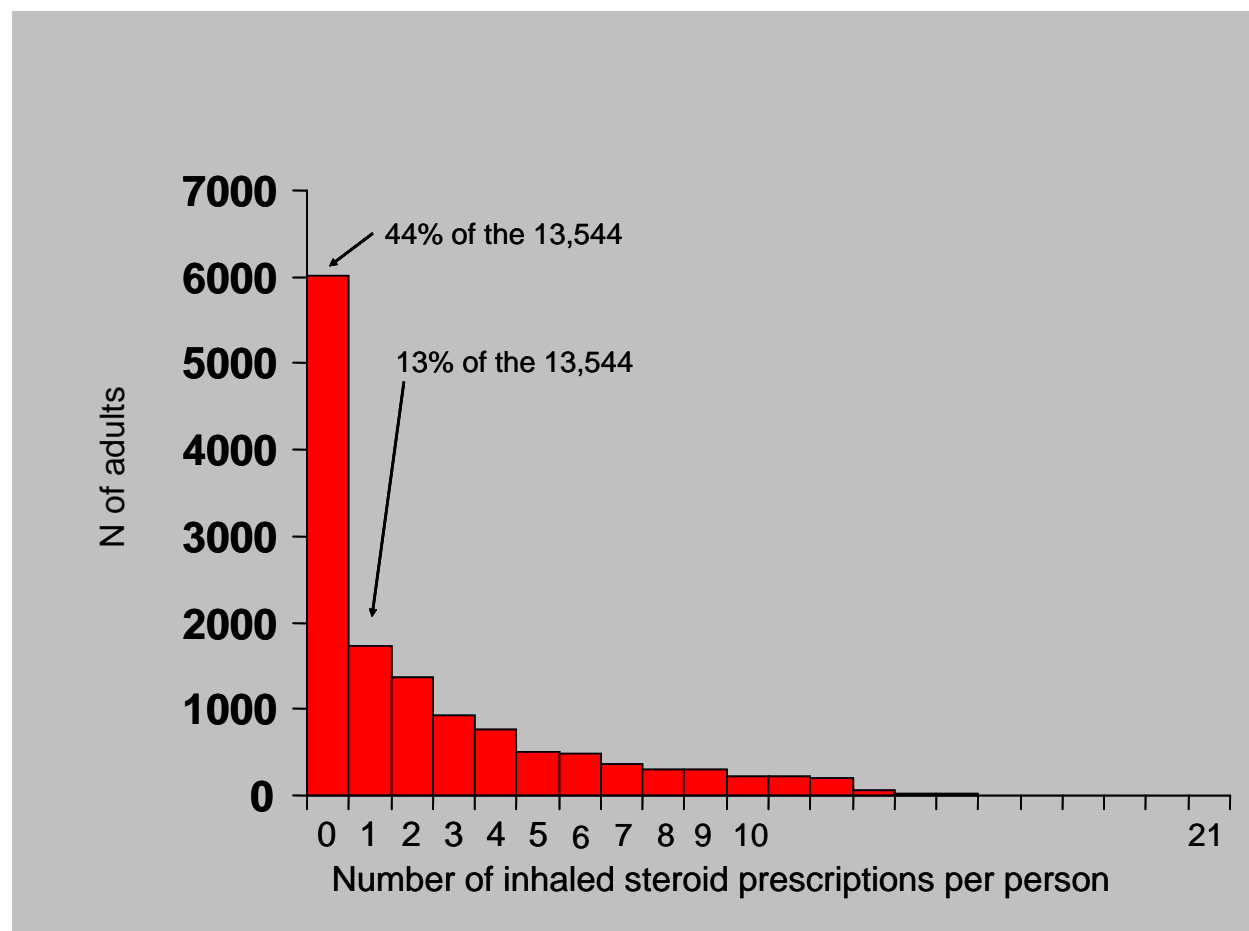


Annual number of physician office visits for children with persistent asthma: According to NHLBI guidelines, children and adults with asthma should be seen by a physician at least twice annually. The majority of children with asthma do not receive this recommended level of care.

*Note: This figure shows the number of office visits the Medicaid cohort of 10,783 children <18 who were identified with persistent asthma using the NCQA case definition and who were also enrolled in Medicaid at least 11 of 12 months during FY 2003.*

**Figure 45 Rx Claims for Inhaled Steroids in Adults 18 – 64  
Indiana Medicaid FY 2003**

Source: OMPP

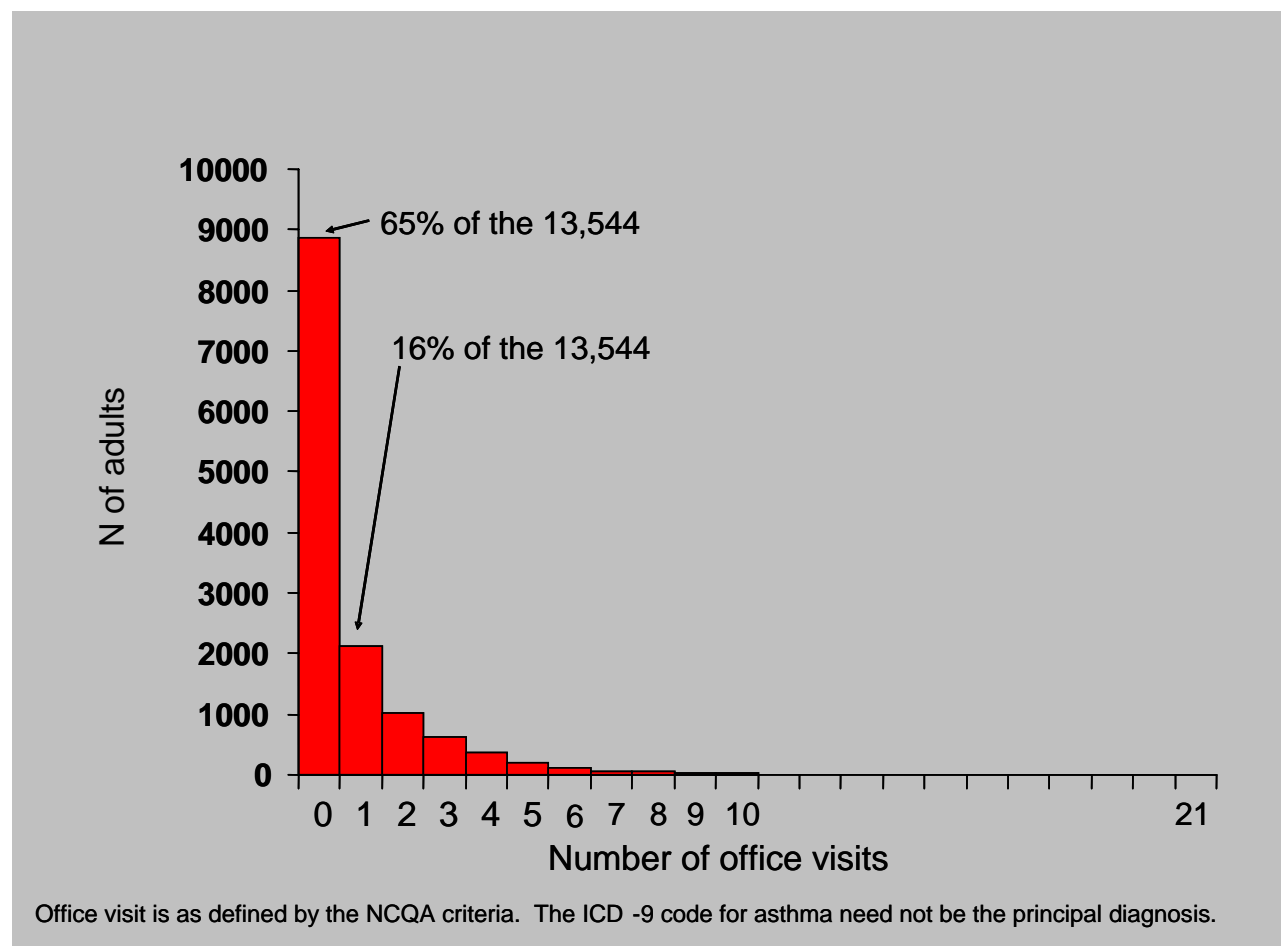


Annual number of prescriptions for inhaled steroids among adults with persistent asthma: According to NHLBI guidelines, children and adults with persistent asthma should use controller medicines daily. This schedule would require several prescriptions annually. The majority of adults with asthma do not receive this recommended number of prescriptions.

*Note: This figure shows the number of prescription claims for inhaled steroids in the Medicaid cohort of 13,544 adults ages 19-64 who were identified with persistent asthma using the NCQA case definition and who were also enrolled in Medicaid at least 11 of 12 months during FY 2003.*

**Figure 46 Office Visits for Asthma in Adults 18 - 64  
Indiana Medicaid FY 2003**

Source: OMPP



Annual number of physician visits for adults with persistent asthma: According to NHLBI guidelines, children and adults with asthma should be seen by a physician at least twice annually. The majority of adults with asthma do not receive this recommended level of care.

*Note: This figure shows the number of office visits in the Medicaid cohort of 13,544 adults ages 19-64 who were identified with persistent asthma using the NCQA case definition and who were also enrolled in Medicaid at least 11 of 12 months during FY 2003.*

# Environment

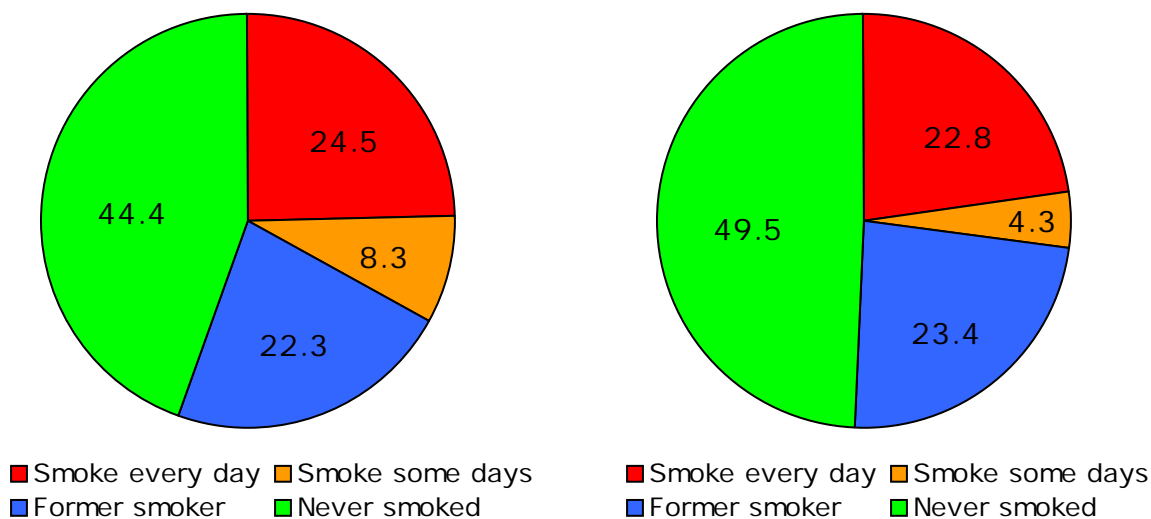
The indoor environment can contain a number of asthma triggers, many of them difficult to measure or estimate, such as dust mites and pet dander in homes. Tobacco smoke is a significant asthma trigger, often found in the air indoors. Smoking habits, patterns and areas where smoking is allowed at work and at home can provide information about exposure to cigarette smoke – both from smoking and second-hand smoke,

The following charts derived from the 2002 BRFSS survey compare the smoking patterns of respondents who reported they had asthma to those of respondents who reported they did not have asthma. A higher percentage of respondents with asthma started smoking younger than the age of 15 than those without asthma. A higher percentage of respondents with asthma started smoking regularly by age 15-19 than respondents without asthma. A higher percentage of respondents without asthma reported they had not smoked in 10 years or more than those with asthma.

Indiana is one of the five worst states for smoking prevalence. Over 27% of adults in Indiana currently smoke. Surprisingly, more than 32% of adults with current asthma in Indiana currently smoke.

**Figure 47 Smoking status, percent distribution in respondents with/without current asthma: Indiana 2002**

Source: BRFSS 2002



## Adults with Current Asthma

## Adults without Current Asthma

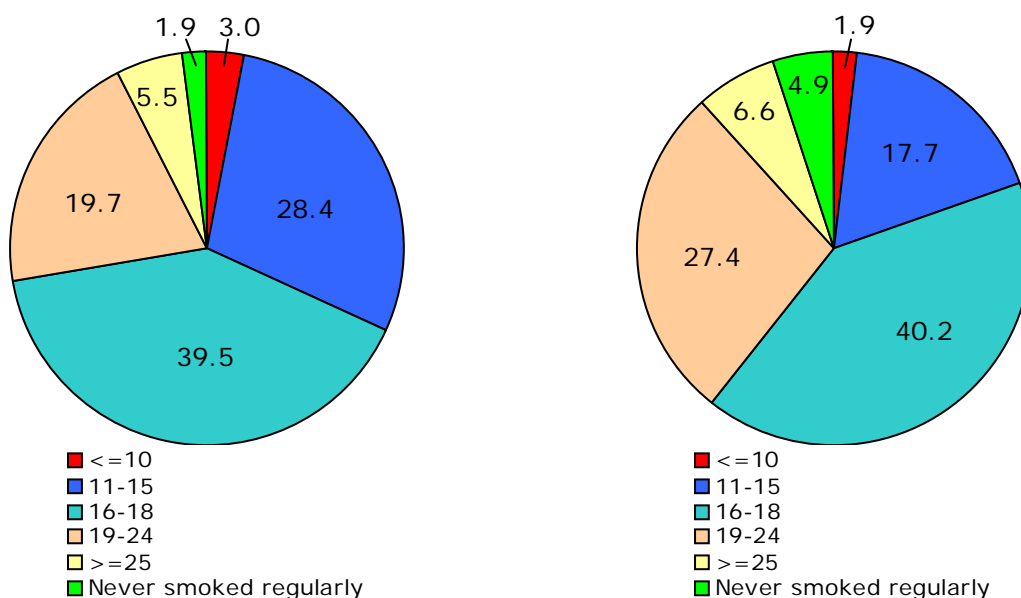
Percentage breakdown of categories within survey populations of respondents with/without current asthma. Percentages may not add up to 100% because respondents who refused to answer, or answered "unknown" to the category questions are not shown.

Survey population of adults with current asthma are respondents who answered "yes" to **both** asthma core questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"

Survey population of adults without current asthma are respondents who answered "no" to **either** of the above questions.

**Figure 48 Age began smoking regularly, percent distribution in respondents with/without current asthma: Indiana 2002**

Source: BRFSS 2002



### Adults with Current Asthma

### Adults without Current Asthma

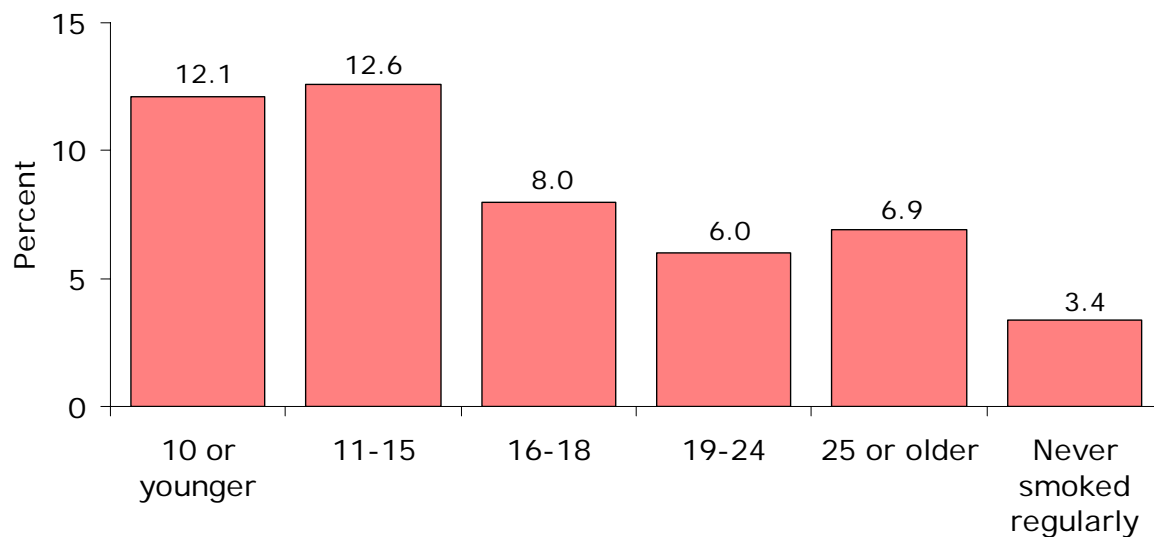
Percentage breakdown of categories within survey populations of respondents with/without current asthma. Percentages may not add up to 100% because respondents who refused to answer, or answered "unknown" to the category questions are not shown.

Survey population of adults with current asthma are respondents who answered "yes" to **both** asthma core questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"

Survey population of adults without current asthma are respondents who answered "no" to either of the above questions.

**Figure 49 Prevalence of current asthma by age first began smoking:  
Indiana 2002**

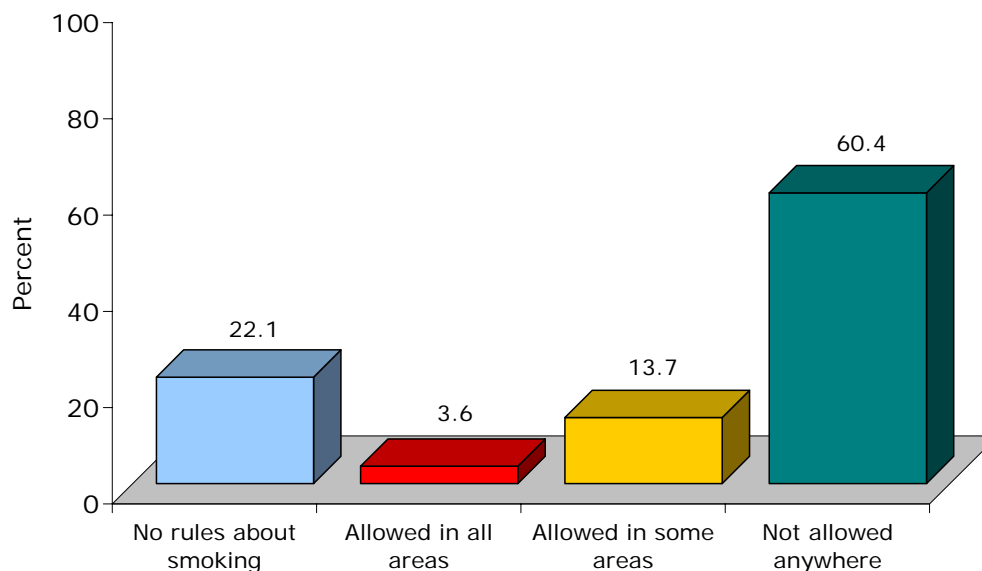
*Source: BRFSS 2002*



*Percentage of respondents within each category who answered "yes" to the questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"*

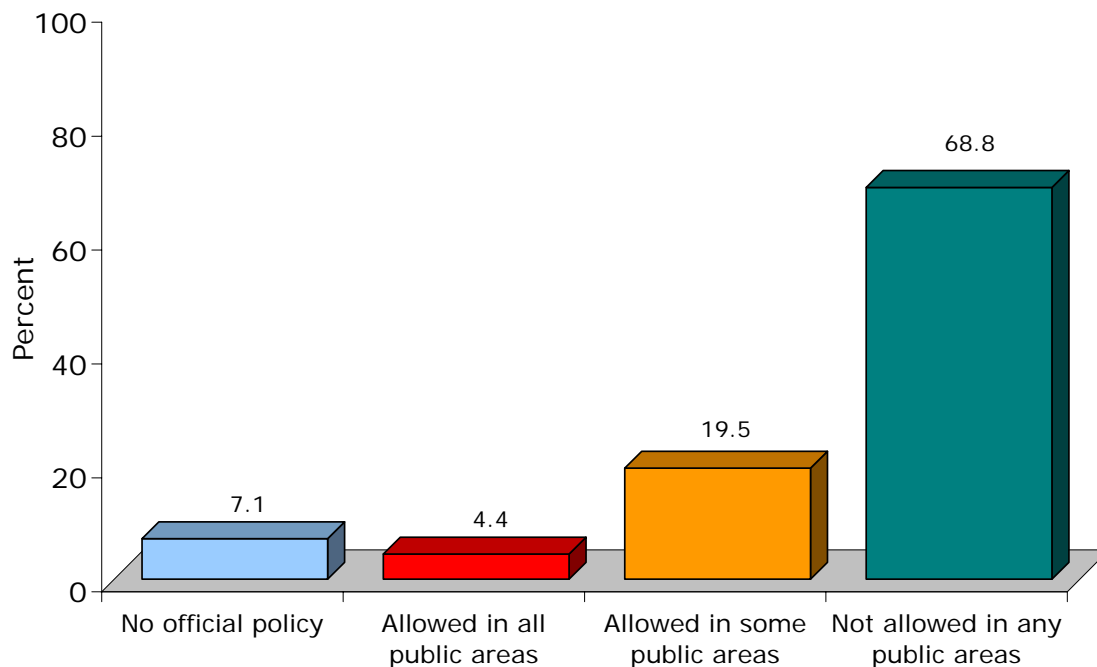
**Figure 50 Percent distribution of smoking rules at home among  
respondents with current asthma: Indiana 2002**

*Source: BRFSS 2002*



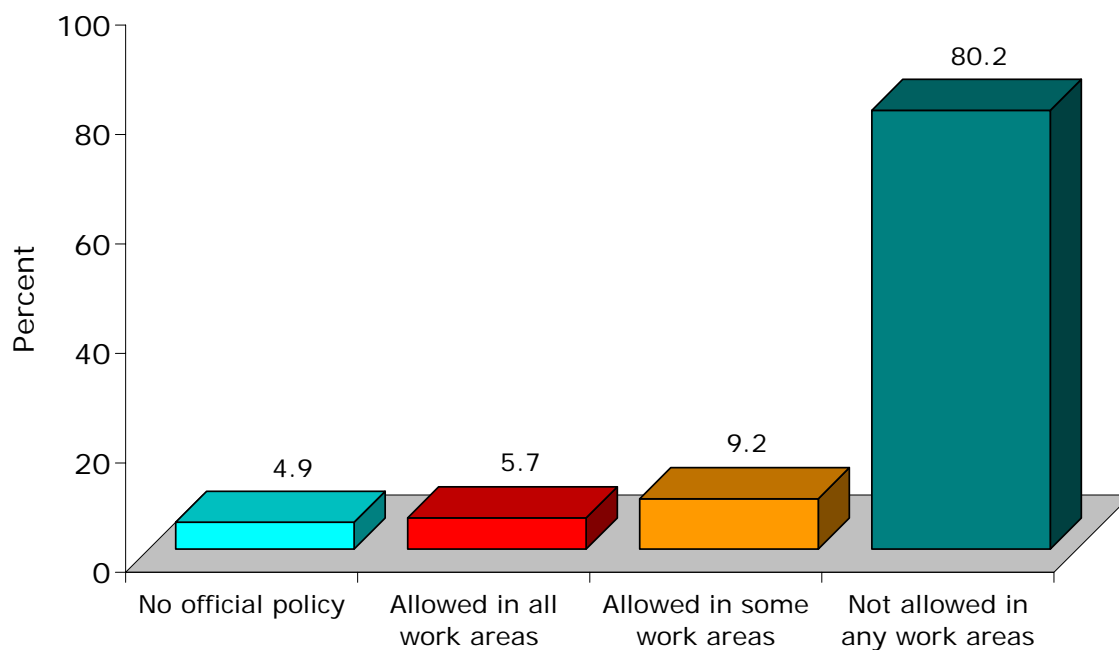
**Figure 51 Percent distribution of smoking rules in common areas at work among respondents with current asthma: Indiana 2002**

*Source: BRFSS 2002*



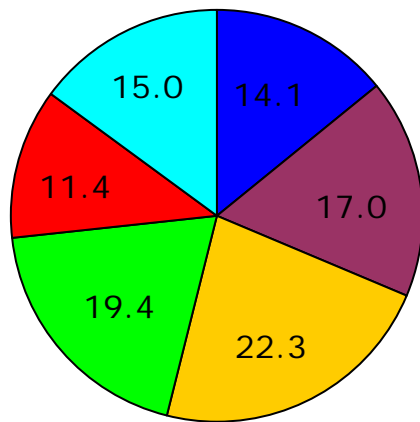
**Figure 52 Percent distribution of smoking rules in work areas at work among respondents with current asthma: Indiana 2002**

*Source: BRFSS 2002*



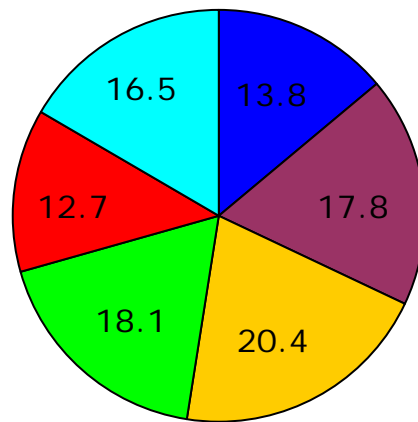
# Appendix

**Figure 1a Age, percent distribution in respondents with/without current asthma: Indiana 2002**  
Source: BRFSS 2002



■ 18-24 ■ 25-34 ■ 35-44  
■ 45-54 ■ 55-64 ■ 65+

## Adults with Current Asthma



■ 18-24 ■ 25-34 ■ 35-44  
■ 45-54 ■ 55-64 ■ 65+

## Adults without Current Asthma

Percentage breakdown of categories within survey populations of respondents with/without current asthma. Percentages may not add up to 100% because respondents who refused to answer, or answered "unknown" to the category questions are not shown.

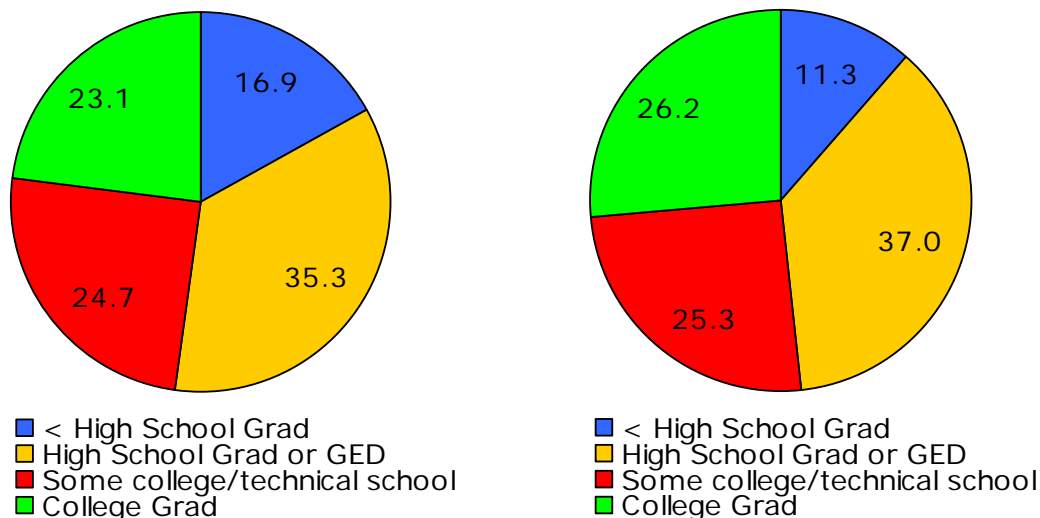
Survey population of adults with current asthma are respondents who answered "yes" to **both** asthma core questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"

Survey population of adults without current asthma are respondents who answered "no" to either of the above questions.



**Figure 2a Educational attainment, percent distribution in respondents with/without current asthma: Indiana 2002**

Source: BRFSS 2002



#### Adults with Current Asthma

#### Adults without Current Asthma

Percentage breakdown of categories within survey populations of respondents with/without current asthma. Percentages may not add up to 100% because respondents who refused to answer, or answered "unknown" to the category questions are not shown.

Survey population of adults with current asthma are respondents who answered "yes" to **both** asthma core questions: "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?"

Survey population of adults without current asthma are respondents who answered "no" to **either** of the above questions.